Reducing unplanned admission to hospital of community dwelling adults

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Reducing unplanned admission to hospital of community dwelling adults: evidence review

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Contents

Acknowledgements

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Summary

What we did and why

We worked with an academic researcher to do a rapid review of published evidence to find out what interventions may reduce unplanned admission to hospital for adults with long-term conditions. We did this to inform some upcoming improvement work on people with long term conditions. We did not include reviews with a focus on frailty, older people, dementia, learning disability, or mental health because these are covered by previous or other planned work.

We wanted to answer the following questions:

- What interventions have been tested or evaluated for reducing unplanned admission to hospital of community dwelling adults?
- Which populations have interventions been tested on?
- What is the effectiveness of any interventions?
- What is the evidence for the cost of any interventions?
- Which interventions are most relevant to the Scottish context?

To answer these questions we searched for existing reviews of research evidence that had been published in five key health and care databases since 2000.

What we found

29 relevant reviews covering various conditions, **21** published in the **last 5 years**. Encompassing at least **770 randomised control trials. These include:**

5 reviews on **COPD**

5 reviews on **heart failure**

1 review on **frequent users of health services**

1 review on **haemophilia**

1 review on **rural populations**

1 review on **haemodialysis**

Interventions and their effectiveness (in relation to reducing unplanned admission to hospital)

In general our review assessed the evidence of effectiveness across the review as lower quality. Many review authors reported that the original trials did not describe intervention components in enough detail, or that there were many differences in the interventions such as who was being supported, what the intervention was and how and where it was delivered or accessed. Reviewing the trials and reviews of these kind of complex interventions is challenging. It is not possible to draw firm conclusions or recommend implementation of specific interventions for NHSScotland based on this review, but there was at least some moderate evidence of effectiveness relating to broad groups of interventions.

Hospital in the home

Hospital in the home may be effective for reducing unplanned hospital admissions in people with different chronic or long term conditions, according to low to moderate quality evidence contained within some well conducted reviews.

Transitional care

Transitional care (including enhanced discharge planning) may reduce within-90 day readmissions and hospital length of stay for mixed patient populations, according to moderate grade evidence. There was consistent but low grade evidence which found transitional care interventions reduced readmission related to congestive heart failure and general medical populations.

Care co-ordination/care strategy

Findings included that health education for people with COPD may reduce all cause readmission at 3 months and that home visits may reduce COPD-specific readmissions but not all cause readmissions (based on moderate evidence from a good quality review); that hospital-initiated nurse co-ordinated care management may reduce readmission in heart failure patients (though the primary data was considered low to very low quality); and that hospital readmissions may be reduced by case management interventions (though there were some different results across studies).

Telephone support

Telephone support did not have enough good quality evidence available to make a clear judgement about its effectiveness. Further robust research is needed.

Advanced care planning

Advanced care planning may reduce hospitalisation in heart failure patients to some extent, though the evidence was low quality. There was limited or very low quality evidence relating to the effectiveness of care plans for patients with COPD or advanced care planning in haemodialysis.

Integrated care

Integrated care may reduce the risk of hospitalisation for people with chronic health problems: in evidence relating to specific conditions it appeared it may be effective in reducing readmissions for heart failure, but for people with haemophilia is less conclusive (though in one review the data ranged from low to very low quality, and was most likely low quality in the other review).

Various interventions

No conclusions could be drawn from the two reviews found

Cost of interventions

Cost was rarely reported and where it was considered the information was limited to one specific type of intervention or had limited relevance to a UK context. Only one example is given in the final report where cost evidence for a UK setting is provided.

Interventions most relevant to Scotland

This was a rapid review and little evidence was found directly linking reviews or their studies to Scotland or the UK. We would encourage readers to consider the full review evidence in more detail to inform judgements as to whether or not any findings are relevant to current and future design and delivery of interventions in the Scottish context.

Main Review

The following report was produced by Steve MacGillivray and Nicola Gray, Scottish Improvement Science Collaborating Centre

Review Questions

A rapid review of the empirical literature in order to help answer the following research questions:

1. What is the range and nature of interventions that have been tested or evaluated?
    a. What are the types of interventions?
    b. What are the components of the interventions?
    c. What is the intensity and duration of any intervention?
    d. Who delivers the intervention?
    e. Where is the intervention delivered?
    f. Are interventions hospital based, community based or both?
2. Which populations have interventions been tested on?
    a. Which conditions or problems?
    b. Which age ranges?
3. What is the evidence for the effectiveness of any interventions that have been tested?
4. What is the evidence for the cost of any interventions?
5. Of the available evidence, which is relevant to the Scottish context?
    a. Based on the available evidence, which are likely to be the best interventions to adopt in Scotland?

Methods

This was a rapid evidence synthesis of any reviews evaluating the effectiveness of interventions designed to reduce hospitalisation in community dwelling adults.

Relevant published literature was identified by searching five key electronic databases: Medical literature analysis and retrieval system online (Medline+); Psychological Literature (PsycINFO); Cumulative Index to Nursing and Health Literature (CinAHL+); Cochrane Database of Reviews; Applied Social Sciences Index and Abstracts (ASSIA).

Search strings were developed and tested for each database (see table 1 for the search string used to search Medline.

Table 1. Search strategy implemented via OVID Medline

1 *Hospitalization/ (36603)
2 *Patient Admission/ (10649)
3 *Patient Readmission/ (7034)
4 *"Length of Stay"/ (11051)
5 or/1-4 (62777)
6 unplanned admission*.ti,ab. (488)
7 unplanned readmission*.ti,ab. (987)
8 unplanned care.ti,ab. (34)
9 unplanned hospitali*.ti,ab. (296)
10 unscheduled care.ti,ab. (124)
11 unscheduled admission*.ti,ab. (81)
12 unscheduled readmission*.ti,ab. (48)
13 unscheduled hospitali*.ti,ab. (55)
14 unanticipated care.ti,ab. (3)
15 unanticipated admission*.ti,ab. (57)
16 unanticipated readmission*.ti,ab. (10)
17 unanticipated hospitali*.ti,ab. (11)
18 unexpected care.ti,ab. (1)
19 unexpected admission*.ti,ab. (67)
20 unexpected readmission*.ti,ab. (32)
21 unexpected hospitali*.ti,ab. (30)
22 ((prevent* or reduc*) adj2 (admission* or readmission* or hospitali*)).ti,ab. (9573)
23 emergency hospital admission*.ti,ab. (411)
24 emergency hospitali*.ti,ab. (335)
25 emergency hospital readmission*.ti,ab. (17)
26 or/6-25 (12159)
27 5 or 26 (70864)
28 Meta-Analysis as Topic/ (16895)
29 meta analy$.tw. (145524)
30 metaanaly$.tw. (1937)
31 Meta-Analysis/ (100271)
32 (systematic adj (review$1 or overview$1)).tw. (141009)
33 exp Review Literature as Topic/ (12194)
34 28 or 29 or 30 or 31 or 32 or 33 (259156)
35 cochrane.ab. (69728)
36 embase.ab. (75129)
37 (psychlit or psyclit).ab. (913)
38 (psychinfo or psycinfo).ab. (28516)
39 (cinahl or cinhal).ab. (23719)
40 science citation index.ab. (2930)
41 bids.ab. (485)
42 cancerlit.ab. (623)

43 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 (123814)
44 reference list$.ab. (16370)
45 bibliograph$.ab. (16648)
46 hand-search$.ab. (6318)
47 relevant journals.ab. (1095)
48 manual search$.ab. (4046)
49 44 or 45 or 46 or 47 or 48 (39836)
50 selection criteria.ab. (28267)
51 data extraction.ab. (18086)
52 50 or 51 (44191)
53 Review/ (2506216)
54 52 and 53 (28355)
55 Comment/ (768544)
56 Letter/ (1024553)
57 Editorial/ (488625)
58 animal/ (6394346)
59 human/ (17697042)
60 58 not (58 and 59) (4541634)
61 55 or 56 or 57 or 60 (6196581)
62 34 or 43 or 49 or 54 (312123)
63 62 not 61 (296237)
64 27 and 63 (1782)
65 limit 64 to (english language and yr="2000 -Current") (1656)

The search results were de-duplicated and then citations screened according to the following inclusion criteria:

Include if:

a. Is a review which primarily focuses on interventions designed to reduce unplanned hospital admission for community dwelling adults
b. Is a review which includes empirical studies which evaluate or test interventions
c. Provides any data relevant to one or more of the five study RQs.

Exclude if:

a. Is not a review of the empirical literature
b. Primarily focuses on:
    - mental health/illness
    - learning disability
    - dementia
    - frailty
c. Reviews that Focus solely on older adults.

Of those reviews that met inclusion criteria, the range and nature of the evidence they contain was reported.

We adopted the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre, 2010) approach to assessing quality and relevance of studies: EPPI-Centre weight of evidence (WoE) judgments were applied to each of the included reviews or studies. Three components were assessed in order to help derive an overall weighting of evidence score (a. methodological quality; b. methodological relevance; c. topic relevance):

a. Methodological quality: the trustworthiness of the results judged by the quality of the study within the accepted norms for undertaking the particular type of research design used in the

study. This involved asking questions related to a study's reporting, context, sample, design, reliability and validity of data-collection and analysis (including appropriate number and range of explanatory variables in the statistical models), ethics, sample size, risk of bias resulting from selection and maintenance of sample, and generalisability.

b. Methodological relevance: the appropriateness of the study design for addressing their particular research question/s
c. Topic relevance: the appropriateness of focus of the research for answering the review question

The following scoring system was used to make assessments for each of the three components assessed: 1 = excellent, 2 = good, 3 = satisfactory, 4 = inadequate.

Judgement of overall weight of evidence (WoE) was made based on the assessments for each of the above criteria and by using the same scoring system. Studies classified as satisfactory overall were still included as they met the inclusion criteria for the review, but less reliance was placed on their results.

Reviews were also intended to be graded as: A (directly relevant, Scottish based); B (probably relevant, non-Scottish based but apply to other UK settings); C (possibly relevant, non UK but should be interpreted with caution due to strong cultural or institutional differences); D (not relevant, clearly irrelevant due to cultural, institutional or legislative differences). However, no reviews were Scottish (or even UK focussed and few studies included in the reviews were set in Scotland. Therefore this was not done.

The nature of the evidence at individual study level was also considered. An assessment of the grade of evidence was assessed drawing upon the methods of the Cochrane Collaboration (see https://gdt.gradepro.org/app/handbook/handbook.html). The evidence was assessed as being of very low, low, medium, or high quality based upon the number and size of studies for any given outcome and the presence or absence of risk of bias.

Results

This rapid review involved conducting a search for reviews of the literature. A total of 3,570 citations were retrieved after searching, of which 2,852 remained after de-duplication (See figure 1 below). Following independent screening of the titles and abstracts by two people, a further 2,760 were removed due to not meeting inclusion criteria. This left 92 citations to be retrieved in full for further detailed scrutiny, after which a further 63 citations were excluded with reasons being given for those exclusions (see table 2 below). Five citations were for reports of studies that were not available. Other reasons for exclusion varied (for example some were protocols, some not reviews of effectiveness, some focussed on elderly populations). However the most common reason (N=31 citations) was that it was not a review of an intervention specifically designed to reduce unplanned hospital admission for community dwelling adults but which did measure hospitalisation as an outcome.

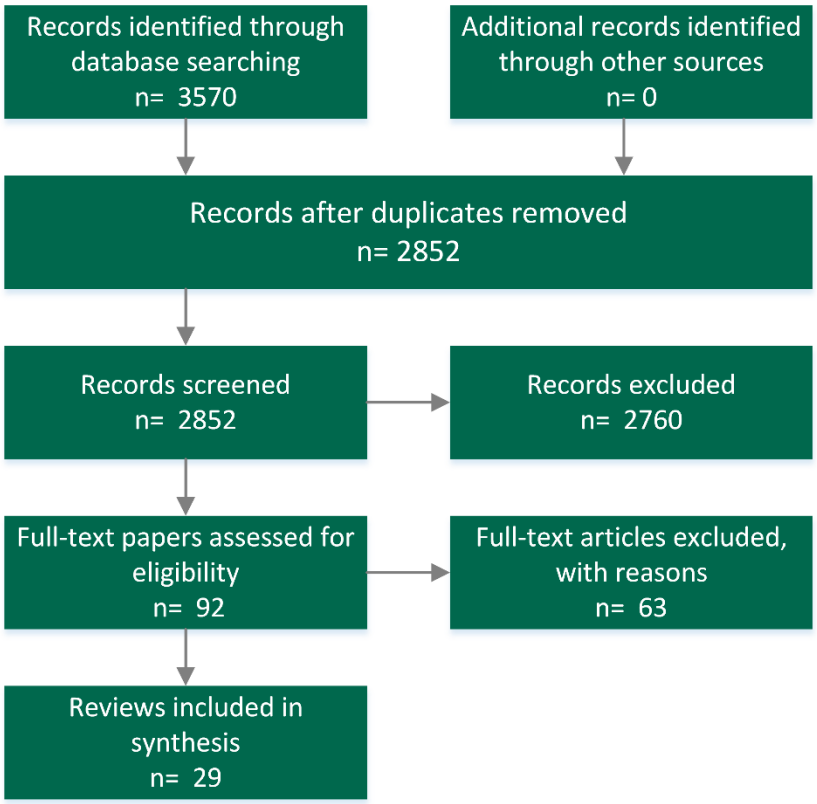

Figure 1. Flow diagram of study selection

Table 2. Full text citations excluded with reasons for exclusion

Reason for exclusion	Citation
Not a review of intervention specifically designed to reduce unplanned hospital admission for community dwelling adults, but which does measure hospitalisation as an outcome.	Aronow WS, Shamliyan TA. Comparative Effectiveness of Disease Management with Information Communication Technology for Preventing Hospitalization and Readmission in Adults With Chronic Congestive Heart Failure. J Am Med Dir Assoc. 2018;19(6):472-9
	Blakemore A, Dickens C, Anderson R, Tomenson B, Woodcock A, Guthrie E. Complex interventions reduce use of urgent healthcare in adults with asthma: systematic review with meta-regression. Respir Med. 2015;109(2):147-56
	Bourbeau J, Lavoie KL, Sedeno M. Comprehensive Self-Management Strategies. Semin Respir Crit Care Med. 2015;36(4):630-8
	Cabilan CJ, Hines S, Munday J. The effectiveness of prehabilitation or preoperative exercise for surgical patients: a systematic review. JBI Database System Rev Implement Rep. 2015;13(1):146-87
	Ditewig JB, Blok H, Havers J, van Veenendaal H. Effectiveness of self-management interventions on mortality, hospital readmissions, chronic heart failure hospitalization rate and quality of life in patients with chronic heart failure: A systematic review. Patient Educ Couns. 2010;78(3):297-315
	du Toit M, Malau-Aduli B, Vangaveti V, Sabesan S, Ray RA. Use of telehealth in the management of non-critical emergencies in rural or remote emergency departments: A systematic review. J Telemed Telecare. 2019;25(1):3-16
	Gibson PG, Powell H, Wilson A, Hensley MJ, Abramson MJ, Bauman A, et al. Limited (information only) patient education programs for adults with asthma. Cochrane Database Syst Rev. 2002:N.PAG-N.PAG
	Gorthi J, Hunter CB, Mooss AN, Alla VM, Hilleman DE. Reducing Heart Failure Hospital Readmissions: A Systematic Review of Disease Management Programs. Cardiol Res. 2014;5(5):126-38
	Goyal P, Delgado D, Hummel SL, Dharmarajan K. Impact of Exercise Programs on Hospital Readmission Following Hospitalization for Heart Failure: A Systematic Review. Curr Cardiovasc Risk Rep. 2016;10(10).
	Kash BA, Baek J, Davis E, Champagne-Langabeer T, Iilangabeer JR, Langabeer JR, 2nd. Review of successful hospital readmission reduction strategies and the role of health information exchange. Int J Med Inform. 2017;104:97-104
	Kotb A, Cameron C, Hsieh S, Wells G. Comparative effectiveness of different forms of telemedicine for individuals with heart failure (HF): a systematic review and network meta-analysis. PloS One. 2015;10(2):e0118681
	Kruse CS, Soma M, Pulluri D, Nemali NT, Brooks M. The effectiveness of telemedicine in the management of chronic heart disease - a systematic review. JRSM Open. 2017;8(3):2054270416681747
	Long G. Impact of Home Telemonitoring on 30-Day Hospital Readmission Rates for Patients with Heart Failure: A Systematic Review. Medsurg Nurs. 2017;26(5):337-48
	Long H, Howells K, Peters S, Blakemore A. Does health coaching improve health-related quality of life and reduce hospital admissions in people with chronic obstructive pulmonary disease? A systematic review and meta-analysis. Br J Health Psychol. 2019; 24(3):515-46
	Mares MA, McNally S. The effectiveness of nurse-led cardiac rehabilitation programs following coronary artery bypass graft surgery: a systematic review protocol. JBI Database System Rev Implement Rep. 2013;11(11):21-32
	McBain H, Shipley M, Newman S. The impact of self-monitoring in chronic illness on healthcare utilisation: a systematic review of reviews. BMC Health Serv Res. 2015;15:1-10
	Mekonnen AB, McLachlan AJ, Brien J-AE. Effectiveness of pharmacist-led medication reconciliation programmes on clinical outcomes at hospital transitions: a systematic review and meta-analysis. BMJ Open. 2016;6(2):e010003
	Moore E, Palmer T, Newson R, Majeed A, Quint JK, Soljak MA. Pulmonary Rehabilitation as a Mechanism to Reduce Hospitalizations for Acute Exacerbations of COPD: A Systematic Review and Meta-Analysis. Chest. 2016;150(4):837-59
	Peytremann-Bridevaux I, Arditi C, Gex G, Bridevaux PO, Burnand B. Chronic disease management programmes for adults with asthma. Cochrane Database Syst Rev. 2015(5)
	Rodrigues CR, Harrington AR, Murdock N, Holmes JT, Borzadek EZ, Calabro K, et al. Effect of Pharmacy-Supported Transition-of-Care Interventions on 30-Day Readmissions: A Systematic Review and Meta-analysis. Ann Pharmacother. 2017;51(10):866-89
	Rosano A, Loha CA, Falvo R, van der Zee J, Ricciardi W, Guasticchi G, et al. The relationship between avoidable hospitalization and accessibility to primary care: A systematic review. Eur J Public Health. 2013;23(3):356-60
	Rotter T, Kinsman L, James E, Machotta A, Willis J, Snow P, et al. The effects of clinical pathways on professional practice, patient outcomes, length of stay, and hospital costs: Cochrane systematic review and meta-analysis. Eval Health Prof. 2012;35(1):3-27
	Rotter T, Kinsman L, James EL, Machotta A, Gothe H, Willis J, et al. Clinical pathways: effects on professional practice, patient outcomes, length of stay and hospital costs. Cochrane Database Syst Rev. 2010:17(3):CD006632

Reason for exclusion	Citation
Not a review of intervention specifically designed to reduce unplanned hospital admission for community dwelling adults, but which does measure hospitalisation as an outcome.	Royal S, Smeaton L, Avery AJ, Hurwitz B, Sheikh A. Interventions in primary care to reduce medication related adverse events and hospital admissions: systematic review and meta-analysis. Qual Saf Health Care. 2006;15(1):23-31
	Rushton M, Howarth M, Grant MJ, Astin F. Person-centred discharge education following coronary artery bypass graft: A critical review. J Clin Nurs. 2017;26(23-24):5206-15
	Self TH, Patterson SJ, Headley AS, Finch CK. Action plans to reduce hospitalizations for chronic obstructive pulmonary disease exacerbations: focus on oral corticosteroids. Curr Med Res Opin. 2014;30(12):2607-15
	Shi Y, Xiong J, Chen Y, Deng J, Peng H, Zhao J, et al. The effectiveness of multidisciplinary care models for patients with chronic kidney disease: a systematic review and meta-analysis. Int Urol Nephrol. 2018;50(2):301-12
	Spinewine A, Claeys C, Foulon V, Chevalier P. Approaches for improving continuity of care in medication management: A systematic review. Int J Qual Health Care. 2013;25(4):403-17
	Taylor RS, Walker S, Smart NA, Piepoli MF, Warren FC, Ciani O, et al. Impact of exercise-based cardiac rehabilitation in patients with heart failure (ExTraMATCH II) on mortality and hospitalisation: an individual patient data meta-analysis of randomised trials. Eur J Heart Fail. 2018;20(12):1735-43
	van Galen LS, Lammers EMJ, Schoonmade LJ, Alam N, Kramer MHH, Nanayakkara PWB. Acute medical units: The way to go? A literature review. Eur J Intern Med. 2017;39:24-31
	Wan TTH, Terry A, Cobb E, McKee B, Tregerman R, Barbaro SDS. Strategies to Modify the Risk of Heart Failure Readmission: A Systematic Review and Meta-Analysis. Health Serv Res Manag Epidemiol. 2017;4:2333392817701050
Protocol	Bobrovitz N, Onakpoya I, Roberts N, Heneghan C, Mahtani KR. Protocol for an overview of systematic reviews of interventions to reduce unscheduled hospital admissions among adults. BMJ Open. 2015;5(8):e008269
	Casimir YE, Williams MM, Liang MY, Pitakmongkolkul S, Slyer JT. Effectiveness of patient-centered self-care education for adults with heart failure on knowledge, self-care behaviors, quality of life, and readmissions: a systematic review protocol. JBI Database System Rev Implement Rep. 2013;11(8):107-28
	Costantini GD, McDermott M, Primiano D, Santomassino M, Slyer JT, Singleton JK. A Systematic Review of Continuity of care and its role in patient satisfaction and decreased hospital admissions in the adult patient receiving home care services. JBI Libr Syst Rev. 2011;9:1-10
	Damery S, Flanagan S, Combes G. The effectiveness of interventions to achieve co-ordinated multidisciplinary care and reduce hospital use for people with chronic diseases: study protocol for a systematic review of reviews. Syst Rev. 2015;4:64
Not a review of effectiveness	Cheema B, Ambrosy AP, Kaplan RM, Senni M, Fonarow GC, Chioncel O, et al. Lessons learned in acute heart failure. Eur J Heart Fail. 2018;20(4):630-41
Not a review of effectiveness	Ivynian S, DiGiacomo M, Newton P, Ivynian SE, Newton PJ. Care-seeking decisions for worsening symptoms in heart failure: a qualitative metasynthesis. Heart Fail Rev. 2015;20(6):655-71
	King AJL, Johnson R, Cramer H, Purdy S, Huntley AL. Community case management and unplanned hospital admissions in patients with heart failure: A systematic review and qualitative evidence synthesis. J Adv Nurs. 2018;74(7):1463-73
	Raghavan D, Bartter T, Joshi M. How to reduce hospital readmissions in chronic obstructive pulmonary disease? Curr Opin Pulm Med. 2016;22(2):106-12
	Shah T, Press VG, Huisingh-Scheetz M, White SR. COPD Readmissions: Addressing COPD in the Era of Value-based Health Care. Chest. 2016;150(4):916-26
No full text available	Clark AM, McAlister FA, Hartling L, Vandermeer B. Randomized Trials of Secondary Prevention Programs in Coronary Artery Disease: A Systematic Review. AHRQ Technology Assessments. 2005
	David S, Sheikh F, Loome JF, Bellantoni MF. Preventing Avoidable Re-hospitalizations Through a Hospital Skilled Nursing Facilities (SNF) Partnership: Systematic Review of Clinical Protocols. J Am Med Dir Assoc. 2015;16(3):B21-B
	Domingo GRR, Reyes FC, Thompson FV, Johnson PM, Shortridge-Baggett LM. Effectiveness of structured discharge process in reducing hospital readmission of adult patients with community acquired pneumonia: A systematic review. JBI Libr Syst Rev. 2012;10(18):1086-121
	Gibson PG, Coughlan J, Wilson AJ, Hensley MJ, Abramson M, Bauman A, et al. Limited (information only) patient education programs for adults with asthma. Cochrane Database Syst Rev. 2000(2):CD001005
	Juhee L, Sunhee P. The effectiveness of telephone-based post-discharge nursing care in decreasing readmission rate in patients with heart failure: a systematic review. JBI Libr Syst Rev. 2010;8(32):1288-303
	Smith SB. Exploration of the evidence to support clinical practice to decrease hospital readmission rates for patients with chronic pancreatitis. University of South Carolina. 2010
Duplicate (see Feltner, 2014b below)	Feltner C, Jones CD, Cene CW, Zheng Z-J, Sueta CA, Coker-Schwimmer EJL, et al. Transitional care interventions to prevent readmissions for persons with heart failure: a systematic review and meta-analysis. Ann Intern Med. 2014;160(11):774-84
Focus on elderly	Feltner C, Jones CD, Cene CW, Zheng Z-J, Sueta CA, Coker-Schwimmer EJL, et al. Transitional care interventions to prevent readmissions for persons with heart failure: a systematic review and meta-analysis. Ann Intern Med. 2014;160(11):774-84

Reason for exclusion	Citation
Focus on elderly	Fergenbaum J, Bermingham S, Krahn M, Alter D, Demers C. Care in the Home for the Management of Chronic Heart Failure. Journal of Cardiovascular Nursing. 2015:S44-51
	Mabire C, Dwyer A, Garnier A, Pellet J. Effectiveness of nursing discharge planning interventions on health-related outcomes in discharged elderly inpatients: a systematic review. J. JBI Database System Rev Implement Rep. 2016;14(9):217-60
	Poupard N, Tang CY, Shields N. Community-based case management does not reduce hospital admissions for older people: a systematic review and meta-analysis. Aust Health Rev. 2019
Review included in Joo Jee, 2019	Joo JY, Liu MF. Case management effectiveness in reducing hospital use: a systematic review. Int Nurs Rev. 2017;64(2):296-308
Withdrawn Cochrane Review	Langhorne P, Dennis M, Kalra L, Shepperd S, Wade DT, Wolfe CDA. Services for helping acute stroke patients avoid hospital admission. Cochrane Database Syst Rev. 2012(1)
Not community dwelling	Mapp ID, Davis LL, Krowchuk H. Prevention of unplanned intensive care unit admissions and hospital mortality by early warning systems. Dimens Crit Care Nurs. 2013;32(6):300-9
	Nolte E, Roland M, Guthrie S, Brereton L. Preventing Emergency Readmissions to Hospital: A Scoping Review. Rand Health Q. 2012;2(1):10
	Paton F, Chambers D, Wilson P, Eastwood A, Craig D, Fox D, et al. Initiatives to reduce length of stay in acute hospital settings: A rapid synthesis of evidence relating to enhanced recovery programmes. Health Serv Deliv Res 2014;2(21)
	Vinson DR, Zehtabchi S, Yealy DM. Can selected patients with newly diagnosed pulmonary embolism be safely treated without hospitalization? A systematic review. Ann Emerg Med. 2012;60(5):651-62.e4
Superseded by Shepperd, 2016	Shepperd S, Iliffe S. Hospital at home versus in-patient hospital care. Cochrane Database Syst Rev. 2005(3):CD000356
	Shepperd S, Doll H, Angus RM, Clarke MJ, Iliffe S, Kalra L, et al. Admission avoidance hospital at home. Cochrane Database Syst Rev. 2008:
Review of risk prediction models	Smith LN, Makam AN, Darden D, Mayo H, Das SR, Halm EA, et al. Acute Myocardial Infarction Readmission Risk Prediction Models: A Systematic Review of Model Performance. Circ Cardiovasc Qual Outcomes. 2018;11(1):e003885
Focus on mental illness	Wright-Berryman JL, McGuire AB, Salyers MP. A review of consumer-provided services on assertive community treatment and intensive case management teams: Implications for future research and practice. J Am Psychiatr Nurses Assoc. 2011;17(1):37-44
Focus is definition and type of hopsitalisation	Yam CHK, Wong ELY, Chan FWK, Wong FYY, Leung MCM, Yeoh EK. Measuring and preventing potentially avoidable hospital readmissions: a review of the literature. Hong Kong Med J. 2010;16(5):383-9
Brief report of Rotter, 2012	Zhang AH, Liu XH. Clinical pathways: Effects on professional practice, patient outcomes, length of stay and hospital costs. Int J Evid Based Healthc. 2011;9(2):191-2

For those excluded reviews that did not focus on interventions specifically designed to reduce unplanned hospital admission for community dwelling adults, but which did measure hospitalisation as an outcome, we examined them in order to report the components of their interventions. (See Appendix 2).

Findings from included reviews

A total of 29 reviews were included in this review of reviews (see characteristics of included reviews in Appendix 1). Reviews were published between 2002 and 2019, with the majority (n=21) being published in the last 5 years. The vast majority of reviews had conducted their searches within 1 year of publication and no review had conducted their search out with 3 years of their publication date. The number of studies included in the reviews ranged from 7 to 76 with the median being 25 studies. All reviews included at least 1 randomised control trial (RCT) with the median being 18 RCTs.

Regarding the methodological quality of the reviews: 4 were graded as inadequate; 5 as satisfactory; 15 as good; and 5 as excellent. Regarding the methodological relevance of the reviews: 3 were graded as inadequate; 4 as satisfactory; 13 as good; and 9 as excellent; regarding the topic relevance of the reviews: none were graded as inadequate; 1 as satisfactory; 21 as good; and 7 as excellent. With regard to weight of evidence: 5 were graded as inadequate; 6 as satisfactory; 14 as good; and 4 as excellent

The majority of reviews (n=15) included a focus on various long term/chronic illnesses. Five reviews focused on heart failure, 5 reviews on COPD, and 1 review each on: rural populations; frequent users of health services; haemodialysis; haemophilia.

Regarding the interventions being tested: 7 focused on hospital/care at home; 6 on transitional care; 6 on care co-ordination/care strategy; 3 on telephone support; 3 on advanced/action care plans; 2 on integrated care; and 2 on various types of interventions. It should be noted however, that whilst these broad areas of intervention type exist, they can and do overlap both in practice and in the individual studies and reviews in this area.

Whilst there are several ways in which the data from the included reviews could be presented, the best way for this review of reviews is deemed to be by the intervention of interest. In this way the effects of any interventions tested for different populations can be compared and contrasted, and the components of the interventions be reported.

Consideration of review findings by intervention studied

Each of the following sections report the number of reviews that contribute evidence of effectiveness for each of the types of interventions. Each section starts with a brief description of the intervention and then provides a tabulated overview of the intervention components for each review. Each section then provides summary statements of the best evidence of effectiveness – (the summary statements are taken only from the reviews that were graded as level 1 or level 2, highlighted in yellow in the tables below, regarding their weight of evidence.

Intervention - Hospital in the Home

Hospital in the Home (HITH), is also known as “hospital at home”, “home hospitalisation” and “early supported discharge”. Most HITH services are nurse based, but they may include doctors and allied health professionals. Some focus on specialties (e.g., surgical specialties, medical specialties, rehabilitation medicine, geriatrics, psychiatry, infectious diseases, respiratory diseases or orthopaedics), diagnostic groups (e.g., hip fracture or stroke) or a mixture.

Seven reviews focussed on interventions designed to reduce unplanned hospital admission by providing HITH (table 3). A total of 110 RCTs were included across the seven reviews.

Five reviews included studies with people with chronic/long term conditions (Caplan[1], Health Quality Ontario[2], Shepperd[3], Totten[4], Vandiver[5]) and two reviews studies specifically of people with COPD (Jeppesen[6], Wong[7]).

Table 3. Overview of HITH Intervention components

Study	Overview of intervention components across studies included in the review
Caplan[1]	The HITH services varied from full multidisciplinary team care and care by partial teams to services with a single health worker, most often a nurse with doctor supervision. Some services included outpatient care and some involved parenteral self-administration of medications (such as antibiotics or heparin), but all involved health practitioners visiting the home and the control group being in hospital. HITH services included makes it difficult to determine which elements of care affected the outcomes. No details were provided regarding frequency, intensity, duration of interventions in the included RCTs.
Health Quality Ontario[2]	A majority of studies (10 of 12) were designed to deliver an in-home care intervention that educated patients on disease facts, lifestyle modification, and medication use. Two studies focused on the home environment and task performance. The in-home care intervention was delivered by nursing professionals in 5 studies, by nursing professionals plus a pharmacist in 2 studies, by community health workers in 1 study, and allied health professionals including community pharmacists in 4 studies. Half of the studies (6 of 12) were designed with 1 or a few scheduled in-home care visits. Four studies scheduled ongoing in-home care visits, and 2 provided in-home care visits as needed.

	The contact time during the in-home care visit ranged from a minimum of 20 to 30 minutes to a maximum of 2 hours.
Shepperd[3]	Admission avoidance hospital at home provides co-ordinated, multidisciplinary care in the home for people who would other-wise be admitted to hospital. People are admitted to admission avoidance hospital at home after assessment in the community by their primary care physician, in the emergency department or a medical admissions unit. For participants allocated to hospital at home, health care was provided by a hospital out-reach team (8 studies), a mix of outreach and community staff (4 studies), or by the general practitioner (GP) and community nursing staff (3 studies). For one of the trials it was not clear who provided care. No details were provided regarding frequency, intensity, duration of interventions in the included RCTs.
Totten[4]	Does provide an overview of components: see table 5 (page 24)
Vandiver[5]	Community-based home health programs The majority of studies focused on the older adult population. The aim of the two RCTs was to assess support methods that would support the shift of care from institution-based to community-based. Support methods identified in these studies were a Medicare-based care advocate program and a health social partnership program based in China. No details were provided regarding frequency, intensity, duration of interventions.
Jeppesen[6]	All trials included patients who presented at emergency rooms with acute exacerbation of COPD. Discharge from hospital and subsequent readmission to "hospital at home" was accomplished within 72 hours following the initial hospital admission. This is a Cochrane review, so it includes a detailed "characteristics of included studies table" (see pages 17 – 30).
Wong[7]	All studies investigated the effects of a supervised, home-based intervention in patients with COPD using a parallel group RCT design. The home-based intervention represented a respiratory nurse providing care, education and support in a patient's home. This is a Cochrane review, so it includes a detailed "characteristics of included studies table" (see pages 17 – 26).

Summary statements of the best evidence of effectiveness

Whilst the evidence varies, there is low to moderate quality RCT-based evidence from some methodologically well conducted systematic reviews that hospital at home/ home care may be effective for reducing unplanned hospital admissions in people with different chronic or long term conditions.

A Cochrane review[3] of 16 RCTs found moderate evidence for little or no difference on the likelihood of being transferred (or readmitted) to hospital (RR 0.98, 95% CI 0.77 to 1.23; P = 0.84; I2 = 28%; 834 participants.

For people with serious or disabling chronic conditions, there is some limited and low quality evidence that Home Based Primary Care reduces hospitalisations and hospital days.

There is moderate quality evidence from 8 RCTs of a significant reduction in readmission rates for hospital at home compared with hospital inpatient care of acute exacerbations of COPD (risk ratio (RR)0.76; 95% confidence interval (CI) from 0.59 to 0.99; P=0.04)[1]. There is low quality, inconclusive evidence form one review of 5 RCTs regarding the effectiveness of outreach respiratory health care worker programmes for COPD patients in preventing hospitalisation.

There is moderate quality evidence from a well-conducted systematic review which includes 12 RCTs indicating that patients (of various diagnostic groups - mainly cardiovascular) receiving in-home care had an average of one less unplanned hospitalisation (mean difference [MD]: −1.03; 95% CI: −1.53 to −0.53) and an average of one less emergency department (ED) visit (MD: −1.32; 95% CI: −1.87 to −0.77)[2].

Table 4. Summary of reviews of hospital at home/home based care interventions

Review	**Review type (search date) Number of studies Intervention type**	**Main aim Setting/population**	**MQ**	**MR**	**TR**	**WoE**	**Main Findings (Strength of evidence)**
Caplan[1]	Systematic review with Meta-analysis (2012) (n=61 RCTs) (Hospital in the home)	To assess the effect of "hospital in the home" (HITH) services that significantly substitute for in-hospital time on mortality, readmission rates, patient and carer satisfaction, and costs. (Various diagnostic groups – mainly stroke, COPD and elderly/frail elderly)	2	1	1	2	HITH care led to reduced readmission rates (OR, 0.75; 95% CI, 0.59 to 0.95; P=0.02; 41 RCTs with 5372 patients) (Unclear – treat as low)
Health Quality Ontario[2]	Systematic review with Meta-analysis (2012) (n=12 RCTs) (In-home care)	To compare the effectiveness of care delivered in the home (i.e., in-home care) with no home care or with usual care/care received outside of the home (e.g., health care setting). (Various diagnostic groups - Mainly cardiovascular)	1	1	2	1	12% reduced risk for in-home care was shown for the outcome measure of combined events, including all-cause mortality and hospitalisations (relative risk [RR]: 0.88; 95% CI: 0.80–0.97). Patients receiving in-home care had an average of one less unplanned hospitalisation (mean difference [MD]: −1.03; 95% CI: −1.53 to −0.53) and an average of 1 less emergency department (ED) visit (MD: −1.32; 95% CI: −1.87 to −0.77). (Moderate)

Shepperd[3]	Cochrane Systematic review with Meta-analysis (2016) (N= 16 RCTs) (Hospital at home)	To determine the effectiveness and cost of managing patients with admission avoidance hospital at home compared with inpatient hospital care (various – including COPD, Stroke)	1	1	2	1	Admission avoidance hospital at home probably makes little or no difference on mortality at six months' follow-up (risk ratio (RR) 0.77, 95% confidence interval (CI) 0.60 to 0.99; P = 0.04; I2 = 0%; 912 participants; moderate-certainty evidence), little or no difference on the likelihood of being transferred (or readmitted) to hospital (RR 0.98, 95% CI 0.77 to 1.23; P = 0.84; I2 = 28%; 834 participants; moderate-certainty evidence), and may reduce the likelihood of living in residential care at six months' follow-up (RR 0.35, 95%CI 0.22 to 0.57; P < 0.0001; I2 = 78%; 727 participants; low-certainty evidence). (Low)
Totten[4]	Systematic review – narrative (2015) (N= 19 of which 2 were RCTs) (Home based primary care)	Assessed the available evidence about home-based primary care (HBPC) interventions for adults with serious or disabling chronic conditions. (Serious or disabling chronic conditions)	2	2	2	2	The strongest evidence was that HBPC reduces hospitalisations and hospital days. Reductions in emergency and specialty visits and in costs were supported by less strong evidence, while no or unclear effects were identified on hospital readmissions and nursing home days. (Low)
Vandiver[5]	Systematic review – narrative (N= 11 of which 2 were RCTs) (Community-based home health programmes)	Reviewed and evaluated literature on the various community-based home health programs and their effectiveness at preventing hospital admissions in adults. (Chronic illness)	4	4	2	4	Some evidence for reduction in health service use in some populations (mainly chronically ill elderly). (Very low)
Jeppesen[6]	Cochrane Systematic review with Meta-analysis (2012) (N= 8 RCTs) (Hospital at home)	To evaluate the efficacy of hospital at home compared to hospital inpatient care in acute exacerbations of COPD (COPD)	1	1	1	1	Eight trials with 870 patients were included in the review and showed a significant reduction in readmission rates for hospital at home compared with hospital inpatient care of acute exacerbations of COPD (risk ratio (RR)0.76; 95% confidence interval (CI) from 0.59 to 0.99; P=0.04). (Moderate)

Wong[7]	Cochrane Systematic review with Meta-analysis (2011) (N= 9 RCTs) (Home care by outreach nurses)	Evaluated the effectiveness of outreach respiratory health care worker programmes for COPD patients in terms of improving lung function, exercise tolerance and health related quality of life (HRQL) of patient and carer, and reducing mortality and medical service utilisation. (COPD)	2	2	2	2	The effect of the intervention on hospitalisations was heterogeneous, reducing admissions in one study, but increasing them in four others, therefore firm conclusions for this outcome could not be drawn. (Low)

Intervention - Transitional care

It should be noted that the reviews in this area overlap somewhat with those focusing on hospital/care at home. However, transitional care interventions should be initiated during hospital admission and continued after discharge through home visits or telephone follow-up for a minimum of one month. They are distinct from case management programmes in that transitional care is provided for a limited time, whereas disease and case management involves continuous guidance of chronically ill patients through the duration of the disease. Transitional care can broadly be described as interventions that target patients who are at risk for readmission based on their risk profile at admission and that promote the safe and timely transfer of patients from hospital to home[8].

Six reviews focused on transitional care interventions (table 5). Only four of the six reviews were considered to be of good methodological quality. One of the reviews[9] included 42 studies of which the majority of study participants were elderly.

Table 5. Overview of transitional care Intervention components

Study	**Overview of intervention components across studies included in the review**
Kansagara[10]	Variations in population studied, intervention definition, personnel, outcome definition, and setting make it difficult to identify strong evidence in support of a specific intervention type that should be broadly implemented. Common themes that emerged across the literature suggesting that successful interventions addressed more aspects of the care transition, included the means to assess and respond to individual peri-discharge needs, and included components that spanned care settings. In practical terms, the actualisation of these themes has been accomplished in many interventions with the addition of transitional care personnel such as nurses and/or pharmacists. Additionally, interventions have often been tailored to the needs of individual patients with the use of needs assessment and patient-centred personalised health records. One of the major weaknesses of the transitional care literature is the marked variation in intervention definitions, timing of outcome follow-up, and descriptions of interventions and usual care.
Leppin[9]	In general, interventions included anywhere from one to seven unique activities. Case management, patient education, home visits, and self-management support were commonly present.
Van Spall[11]	Interventions were described as a health service intervention that aimed to prepare patients for the transition from hospital to home: the intervention could involve educating, monitoring, clinically following, or supporting the patient in the post-discharge phase, and could be offered in the hospital, the home, or in a clinic. Table 1 (page 1431-1437) gives a summary of each intervention tested in each included study.

Verhaegh[8]	Defined high-intensity transitional care interventions as those with scores of 9–16 on a scale of 0 to 16 by summing eleven measures of intervention intensity (the measures are explained in Appendix Exhibit A6) In-hospital components of transitional care interventions varied across the studies. Fourteen of them (54%) included a comprehensive patient assessment at admission, twenty-one (81%) provided self-management education during admission, and fourteen (54%) involved caregivers as secondary recipients of the study intervention. Care coordination by a nurse was present in eighteen studies (69%). Only seven studies (27%) included communication between the hospital and a primary care provider within one week after discharge. On average, studies included three (range: 1–12) scheduled home visits and two (range: 1–13) scheduled telephone follow-up calls.
Kamermeyer[12]	Studies utilised multicomponent discharge interventions, including standardised discharge instructions, a post-discharge provider appointment, follow-up phone calls and medication reconciliation. While some studies utilized a dedicated Transitions of Care (TOC) employee, others utilised a team-based approach. While the majority of the studies utilised inpatient-based personnel who worked to transition the patient to the home setting, one study utilised an outpatient approach where a community-based advanced practice nurse visited the patient prior to hospital discharge and then implemented TOC interventions in the home.
Naylor[13]	Studies varied considerably in terms of their nature, point of initiation, intensity, and duration. The largest group were characterised as comprehensive discharge planning and follow-up with (four studies) or without (three studies) home visits. The remainder dealt with disease or case management (four studies), coaching (two studies), education or psychoeducation (two studies), peer support (two studies), telehealth facilitation (one study), mobile crisis (one study), post-discharge geriatric assessment (one study), or intensive primary care (one study). Fourteen of the twenty-one interventions were initiated in advance of patients' hospital discharges, although the time was specified in only six studies (range: within 24 hours of admission to 24 hours prior to discharge). Twelve interventions included at least one post-discharge home visit as part of the protocol, and three studies incorporated in-person contact but not in patients' homes (for example, during physician office or clinic visits). On average, post-discharge follow-up was initiated within three days of hospital discharge (range: 1–14 days).

Summary statements of the best evidence of effectiveness

A report[10] of a review of 10 reviews found that among reviews of mixed patient populations, there was consistent evidence that enhanced discharge planning and hospital-at-home interventions reduced readmissions.

There is moderate-strength evidence that structured and individually tailored discharge planning reduces readmissions within 90 days (relative risk [RR]: 0.82, 95% confidence interval [CI]: 0.73 to 0.92)[9] and hospital length of stay (20.91 days, 95% CI: 21.55 to 20.27)[8].

Among 7 reviews in specific patient populations, transitional care interventions reduced readmission in patients with congestive heart failure and general medical populations[10]. Whilst the evidence in this area is described as consistent, the grade of evidence should be considered as low.

Findings from a review of 26 RCTs suggest that transitional care was effective in reducing all-cause intermediate-term and long-term readmissions[8]. Only high-intensity interventions seemed to be effective in reducing short-term readmissions.

Table 6. Reviews of transitional care interventions

Review	**Review type (search date) Number of studies Intervention type**	**Main aim Setting/population**	**MQ**	**MR**	**TR**	**WoE**	**Main Findings (Strength of evidence)**
Kansagara[10]	Review of reviews (2017) (N= 10 reviews) (Transitional care)	Summarises the health and utilisation effects of transitional care interventions, and to identify common themes about intervention types, patient populations, or settings that modify these effects (Various diagnostic groups)	2	2	1	2	Among 10 reviews of mixed patient populations, there was consistent evidence that enhanced discharge planning and hospital-at-home interventions reduced readmissions. Among 7 reviews in specific patient populations, transitional care interventions reduced readmission in patients with congestive heart failure and general medical populations. (Low)
Leppin[9]	Systematic Review with Meta-analysis (2013) (N= 42 RCTs) (Transitional care)	Synthesised the evidence of the efficacy of interventions to reduce early hospital readmissions and identify intervention features, including their impact on treatment burden and on patients' capacity to enact post-discharge self-care that might explain their varying effects. (Various)	2	2	2	2	Most interventions tested are effective in reducing the risk of early readmissions. Some features, however, may enhance the effect of these programs. In particular in interventions that supported patients' capacity for self-care in their transition from hospital to home. (Low to moderate)
Van Spall[11]	Systematic review with Network	Compared the effectiveness of transitional care services in decreasing all-cause	2	1	2	2	Among services that significantly decreased all-cause readmission, nurse home visits were most

	Meta-analysis (2015) (N= 53 RCTs) (Transitional care services)	death and all-cause readmissions following hospitalisation for heart failure. (Heart failure)					effective [ranking P-score 0.8365; incident rate ratio (IRR) 0.65, 95% CI 0.49–0.86], followed by nurse case management (NCM) (ranking P-score 0.6168; IRR 0.77, 95% CI 0.63–0.95), and DMCs (ranking P-score 0.5691; IRR 0.80, 95% CI 0.66–0.97). (Unclear – most likely low to moderate)
Verhaegh[8]	Systematic review with Meta-analysis (2013) (N= 26 RCTs) (Transitional care)	Examined if transitional care interventions were associated with a reduction of readmission rates in the short (30 days or less), intermediate (31–180 days), and long term (181–365 days) (Chronic illness)	2	2	2	2	Transitional care was effective in reducing all-cause intermediate-term and long-term readmissions. Only high-intensity interventions seemed to be effective in reducing short-term readmissions. (Unclear – most likely low to moderate)
Kamermeyer[12]	Systematic review – narrative (2016) (N=13 of which some ?4 were RCTs) (Transfer of care)	Assessed the clinical effectiveness of Transfer of Care interventions to reduce 30-day readmission rates. (Various diagnostic groups)	3	3	2	3	Six studies demonstrated a statistically significant reduction in the 30-day readmission rate. (Low)
Naylor[13]	Non-systematic review (Not stated – prior to 2011) (N= 21 RCTs) (transitional care)	To examine effective transitional care interventions within the context of health reform, focussing only on randomised clinical trials conducted in the United States (Chronic illness)	4	4	2	4	Nine interventions demonstrated positive effects on measures related to hospital readmissions. Most of the interventions led to reductions in readmissions through at least thirty days after discharge. Many of the successful interventions shared similar features, such as assigning a nurse as the clinical manager or leader of care and including in-person home visits to discharged patients. (Unclear – most likely Low)

Intervention - Care co-ordination/care strategy

Care coordination is the deliberate organisation of patient care activities between two or more participants (including the patient) involved in a patient's care to facilitate the appropriate delivery of health care services. Organising care involves the marshalling of personnel and other resources needed to carry out all required patient care activities; it is often managed by the exchange of information among participants responsible for different aspects of care.

Six reviews focused on care co-ordination/care strategy interventions: two reviews focused on people with heart failure, two focused on people with COPD, one on frequent users of health services, and one on people with chronic illness.

Table 7. Overview of care coordination Intervention components

Study	Overview of intervention components across studies included in the review
Huntley[14]	The majority of studies (n=15) described the intervention being delivered by a case manager/specialist nurse with no specific mention of other health professionals, and the remaining seven studies described a case manager/specialty nurse working as part of a multidisciplinary team. The duration of the case management interventions in the studies was 1–24 months (with the majority having a duration of three months or six months). The majority of studies were conducted face to face or a combination of in-person and by phone. Four interventions were conducted purely by phone. Outcomes were measured to match the total duration of intervention in the majority of studies. For many of the studies, the intensity of interventions was not stated explicitly. When intensity was described, it was always a tapered approach after an initial intensive period. See table 1: Components of CM interventions, page 3.
Joo Jee[15]	Case management (CM) intervention types included community- and hospital-based interventions, as well as and interventions that were initiated in hospitals and carried over into communities. The duration of CM interventions was one month to 15.9 years. Three studies reviewed trials of nurse-led CM interventions. Other studies reviewed trials that included multidisciplinary teams with case managers. All CM interventions were congruent with the components of the Case Management Society of America's definitions of CM: they included assessment and planning, education, transitional services, referrals to primary or other social or health services, and face-to-face or telephone contacts for regular follow-up.

Prieto-Centurion[16]	Interventions in each study are summarised in Tables 2 and 3, with more detailed descriptions in Tables E2, E4, and E5. More than 15 different strategies formed intervention bundles (i.e., multiple interventions implemented as part of a care strategy) across the various studies. The number of interventions in the bundle used in each study ranged from 9 to 11. All five studies provided patient education about use of respiratory inhalers, developed an action plan (instruction on steps to be taken in case of worsening symptoms), and provided participants a hotline (phone or pager number that patients could call as needed). The intervention bundle in four studies also included a different combination of education about COPD, general health counselling (e.g., living a healthy lifestyle), coordination with the patient's primary provider, home visits, and a follow-up phone call. Less frequent interventions included smoking cessation counselling (three studies), social services referral (two studies), assessment of comorbidities (one study), discharge planning (one study), and pulmonary rehabilitation (one study). There was substantial heterogeneity between studies, such as the timing (e.g., pre-discharge vs. post-discharge), frequency (e.g., number of home visits), and how each intervention was delivered (e.g., type and number of personnel conducting interventions). Two studies initiated interventions more than 28 days after hospital discharge
Yang[17]	Most interventions involved home visits and health education. Three interventions added regulated monthly telephone calls. In most RCTs, community nurses conducted home visits, most of which began within seven days after discharge. Two RCTs included visits within 1-3 months of discharge. Only 1 RCT specified that visits occurred within 14 days of discharge.
Tricco[18]	The following strategies were used to improve care coordination: case management (n = 29 studies), team changes (n = 21), self-management (n =19) and clinical information systems (n = 1). The number of quality improvement strategies examined per study ranged from one to five (median 2.5). The intervention included outreach activities in 23 studies and patient navigators in six studies. Details about the strategies are included in Appendices 3 and 4.
Shah[19]	See table 2 (page 920) for very brief description of Intervention Components

Summary statements of the best evidence of effectiveness

Moderate evidence suggests that health education reduces all cause readmission at three months. Home visit also reduces COPD-specific readmissions, but does not reduce all-cause readmissions[17].

Tricco[18], in a review of studies on frequent users of health services, found (low to moderate evidence) that significantly fewer patients in the intervention group than in the control group were admitted to hospital (relative risk [RR] 0.81, 95% confidence interval [CI] 0.72–0.91).

Of the two reviews focused on heart failure, one (Shah[19]) was not well-conducted and only provides very low quality inconclusive data. The remaining review (Huntley[14]) provides low to very low quality data indicating that hospital-initiated nurse co-ordinated care management compared with usual care reduces readmissions (rate ratio 0.74 (95% CI 0.60 to 0.92), p=0.008).

Hospital readmissions, length of hospital stay, institutionalisation, emergency department visits, and hospitals/primary care visits were all identified as health care utilisation outcomes of case management interventions[15]. There was evidence that these interventions positively reduced health care utilisation; however, results were mixed.

Table 8. Reviews of care co-ordination/care strategy interventions

Review	**Review type (search date)** **Number of studies** **Intervention type**	**Main aim** **Setting/population**	**MQ**	**MR**	**TR**	**WoE**	**Main Findings** **(Strength of evidence)**
Huntley[14]	Systematic review with Meta-analysis (2015) (N=22 of which 17 were RCTs) (Nurse coordinated multicomponent care)	To investigate the effectiveness and related costs of case management (CM) for patients with heart failure (HF) predominantly based in the community in reducing unplanned readmissions and length of stay (LOS) (Heart Failure)	1	1	2	1	Hospital-initiated CM reduced readmissions (rate ratio 0.74 (95% CI 0.60 to 0.92), p=0.008) and LOS (mean difference −1.28 days (95% CI −2.04 to −0.52), p=0.001) in favour of CM compared with usual care. (Low to very low)
Joo Jee[15]	Review of reviews (2017) (N= 7 reviews involving a total of 76 RCTs) Case management	Evaluated the effectiveness of case management interventions for improving health care utilisation outcomes for individuals with chronic illnesses (Chronic illness)	2	1	1	2	Hospital readmissions, length of hospital stay, institutionalisation, emergency department visits, and hospitals/primary care visits were all identified as health care utilisation outcomes of case management interventions. There was evidence that these interventions positively reduced health care utilisation; however, results were mixed. (Unclear – most likely Low)
Prieto-Centurion[16]	Systematic review – narrative (N= 5 RCTs)	Review of randomised clinical trials evaluating interventions to reduce	2	2	2	2	The evidence base is inadequate to recommend specific interventions to

	(intervention bundles (i.e., multiple interventions implemented as part of a care strategy)	the rehospitalisations after COPD exacerbations. (COPD)					reduce rehospitalisations in this population. (Low)
Yang[17]	Systematic review with Meta-analysis (2015) (N= 31 RCTs) (Continuity of care)	Assessed the efficacy of continuity of care as interventions, which reduced readmission and mortality. (COPD)	2	2	2	2	Health education reduced all cause readmission at three months. Home visit also reduced COPD-specific readmissions but did not reduce all cause readmissions. (Moderate)
Tricco[18]	Systematic review with Meta-analysis (2014) (N=50 of which 36 were RCTs) (Care co-ordination)	Evaluated the effectiveness of interventions to improve the coordination of care to reduce health care utilisation in frequent users if health services. (Frequent users of health services)	2	2	3	3	Significantly fewer patients in the intervention group in the control group were admitted to hospital (Relative Risk [RR] 0.81, 95% confidence interval [CI] 0.72–0.91). (Low to moderate)
Shah[19]	Systematic review – narrative (N= 10 studies, 3 of which were RCTs) (Interprofessional care teams)	Examines the evidence for the effectiveness of interprofessional care teams to reduce readmissions in people with Heart failure. (Heart failure)	4	3	2	4	Trial based data is inconclusive. (Very low)

Intervention - Telephone support specifically

Telephone follow-up (TFU) calls are a method to enhance communication with patients and families in the critical period following discharge from the hospital. A timely clinical point of contact, such as a telephone call or follow-up visit, is included as a core recommendation of many large-scale efforts to reduce readmissions.

Three reviews focused specifically on telephone support interventions (table 9).

Table 9. Overview of telephone follow-up Intervention components

Study	Overview of intervention components across studies included in the review
Hobbs[20]	Participants received telephone follow-up from a nurse, pharmacist, physician, or social worker. The nature of the questions asked varied, either consisting of a scripted set of questions or did not follow any format. Topics included patient education (regarding symptoms management, weight control, diet, or medication reconciliation), support reassurance, or community resource information. Frequency and timing of telephone calls varied. Health care workers initiated calls from the first week of discharge to four weeks after discharge. The initial number of calls and intervals between them varied too. The majority of study participants only received one call. From 33 studies, only five contacted participants more than 10 times during the three-month follow-up period.
Jayakody[21]	Regarding delivery, telephone follow-up (TFU) was provided by nurses in seven of the ten studies, and by resident doctors in one study. One study used trained volunteers who were university students pursuing a premedical track, and one study did not report who made the follow up call. Varying numbers of telephone calls were provided as part of follow-up, ranging from one, up to approximately 16. Seven studies reported the content of the TFU calls, however the level of detail reported varied. Four studies reported TFU which included an assessment of the patient's health and adherence to treatment, for example, symptom control, medication compliance, dietary adherence, care-management orders, and activity capacity. Two studies reported TFU which included education or coaching for the patient regarding self-care skills or what to do if they are not feeling well. Two studies monitored patients' health, and the nurse intervened as necessary but provided no further detail of the call content. One study used TFU to assess the patient's experience of the care transition and their understanding of the hospital stay.

	Appointments were made during TFU for follow up care in two studies. One study also asked the patient about any readmissions they had since discharge. Three of the studies which provided information on the content of the call, reported using a structured format which followed a set of questions or a script.
Johnson[22]	This paper is essentially a discussion of three main areas for telephone follow-up which need to be addressed in the development of TFU programs: (1) Who should make the call? (2) Which information is essential? (3) What is the optimal timing, frequency, and duration of follow-up calls?

Summary statements of the best evidence of effectiveness

Evidence across the reviews is graded as low to very low. No definitive statement can be made about the effectiveness of TFU. The variability of evidence regarding telephone follow-up guidelines points to the need for further research with larger sample sizes and more rigorous methodologies.

Table 10. Reviews of telephone support interventions

Review	**Review type (search date) Number of studies Intervention type**	**Main aim Setting/population**	**MQ**	**MR**	**TR**	**WoE**	**Main Findings (Strength of evidence)**
Hobbs[20]	Systematic review – narrative (2013) (N=8 of which 5 were RCTs) (Telephone follow-up)	To evaluate if post-discharge telephone follow-up for adult with heart failure reduces hospital readmission rates. (Heart Failure)	3	2	2	3	Findings suggest that telephone follow-up and multidisciplinary interventions after discharge better prepare people with HF to manage associated complications. (Low to very low)
Jayakody[21]	Systematic review – narrative (2015) (N=10 of which 1 was an RCT) (Telephone follow-up)	To investigate the effectiveness of telephone follow-up, either on its own or in combination with other intervention components. (Chronic Illness)	3	3	2	3	Of ten intervention studies, five were effective in reducing readmissions within 30 days. However the methodological quality of studies was poor. (Very low)
Johnson[22]	Non-systematic review of the literature (2013) Selected studies (Telephone follow-up)	Examined peer reviewed articles examining telephone follow-up to improve post-discharge processes and reduce avoidable readmissions (Various)	4	4	2	4	The variability of evidence and experience regarding Telephone follow-up guidelines points to the need for further research with larger sample sizes and more rigorous methodologies. (Very low)

Intervention - Advanced care planning

A recent consensus statement[23] defines advance care planning (ACP) as that which "enables individuals to define goals and preferences for future medical treatment and care, to discuss these goals and preferences with family and health-care providers, and to record and review these preferences if appropriate." Advanced care planning, including the use of action plans, offer a form of self-management that can be delivered in the outpatient setting to help individuals recognise and initiate early treatment for exacerbations, thereby reducing their impact.

Three reviews focused on advanced care planning interventions (table 11).

Table 11. Overview of advanced care planning Intervention components

Study	Overview of intervention components across studies included in the review
Howcroft[24]	Characteristics of included studies are provided (pages 30-51). Three studies used a standard written action plan and information booklet. Three studies used an individualised action plan intervention. One study provided an intervention consisting of additional care that included individual instructions for what to do in case of exacerbations. In one study, participants also received an individual educational session with a nurse experienced in managing respiratory disease. Their action plan was a written self-management plan that was developed in consultation with their treating GP. It listed the participant's maintenance medications and an individualised action plan based on early recognition of symptoms associated with exacerbations of COPD. 76% received a standard action plan with instructions to self-initiate a short course of oral corticosteroids and an antibiotic. The other 24% received an action plan with instructions to initiate antibiotics only (N = 10), to double their dose of inhaled corticosteroids and commence an antibiotic (N = 2), to initiate a short course of oral corticosteroids only (N = 1) or to contact their GP (N = 3). Participants following action plans that involved self-initiation of medication were given prescriptions by their GP. All intervention participants were encouraged to present to their GP early. Two studies used action plans that were identical and provided advice on management of usual care and exacerbations, together with a booklet on self-management, a prescription from their GP for prednisolone and a broad-spectrum antibiotic for self-administration during an exacerbation. One study made no attempt to individualise instructions in the action plan, whereas the remaining four trials delivered self-management plan education in an individual session provided by a nurse, a respiratory educator or the participant's GP.

Kernick[25]	In most studies, ACP was only one part of a specialist palliative care, or integrated cardiology–palliative care intervention, and was not described specifically. In a feasibility RCT, where ACP was the focus of the intervention, a description was provided (duration, timing and number of visits and by whom; production of a future care plan; nurse telephone support as needed) but not in the detail required to identify whether it included the elements recommended by Reitjens et al. In one study no detail was given about the process whereby patients had received an advance directive or not. However, it was apparent that patients could receive an advance directive even if they were not under the care of a palliative physician, thus implying this was part of generic practice. No details were given about any other aspect of ACP.
Lim[26]	In one of the two included studies, the intervention group participants completed 60 to 90 minute interviews with a trained facilitator. Patient centred-advanced care planning (PC-ACP) assessed patient and surrogate understanding and experiences with illness, provided information about disease-specific treatment options and their benefits and burdens, assisted in documenting patient preferences for treatment, and assisted surrogate partners to make decisions in line with patients' preferences. In the second study, participants were assigned to a peer-mentoring intervention group, or to a printed material intervention group, or to a control group to receive routine care. Study duration was two to four months for each participant. Participants randomised to the peer mentoring intervention group were contacted by peers eight times (five telephone calls and three face-to-face meetings) to discuss the value of completing advance directives. Peers had attended regional advanced directive work-shops where advance directives issues were discussed. Peer mentors and patients discussed the programme, gave their own experience with chronic illness, goals outside end stage kidney disease (ESKD), spiritual orientation and fears, end-of-life considerations and barriers to completing advance directives, contribution to others and patient's strength. Participants in the printed material received literature developed by the (US) National Kidney Foundation.

Summary statement of the evidence of effectiveness

The best evidence (although of low quality) suggests that advanced care planning may reduce hospitalisation in heart failure patients – however it is not clear though to what degree.

Evidence is limited or of very low quality regarding the effectiveness of care plans for patients with COPD, or for advanced care planning for people undergoing haemodialysis.

Table 12. Reviews of advanced care planning interventions

Review	Review type (search date) Number of studies Intervention type	Main aim Setting/population	MQ	MR	TR	WoE	Main Findings (Strength of evidence)
Howcroft[24]	Cochrane Systematic review with Meta-analysis (2015) (N=7 RCTs) (Action Plans)	To compare effects of an action plan for COPD exacerbations provided with a single short patient education component and without a comprehensive self-management programme versus usual care. (COPD)	1	1	2	2	Subgroup analysis by ongoing support for action plan use was limited; review authors noted no subgroup differences in the likelihood of hospital admission or ED visits or all-cause mortality over 12 months. (Moderate)
Kernick[25]	Systematic review – narrative (2017) (N= 8 of which 3 were RCTs) (Advanced care planning)	Evaluates the literature regarding advance care planning in heart failure (Heart failure)	2	3	1	3	Advance care planning reduced hospitalisation in five of seven studies. (Low)
Lim[26]	Systematic Review with Meta-analysis (2016) (N= 2 RCTs) (Advanced care planning)	To determine whether advance care planning in haemodialysis patients, compared with no or less structured forms of advance care planning, can result in fewer hospital admissions or less use of treatments (Haemodialysis patients)	2	2	2	4	Sparse data assessed at suboptimal quality meant that there is an inability to formulate conclusions about whether advance care planning can influence numbers of hospital admissions and treatment required (Very low)

Intervention - Integrated care

Integrated care commonly involves provision of comprehensive community-based care for people with chronic conditions. It is anticipated that implementation of integrated care, with a proactive approach to management of chronic conditions, will reduce reliance on hospital and emergency department (ED) services. Integrated care usually involves the following components (as described in the Chronic Care Model): self-management support, decision support, delivery system design, and clinical information systems.

Two reviews focused on integrated care interventions (table 13).

Table 13. Overview of integrated care Intervention components

Study	Overview of intervention components across studies included in the review
Stephenson[27]	Many reviews described the integrated care interventions in terms of the Chronic Care Model (CCM), with any interventions involving two or more components of the CCM considered to constitute integrated care. Table 1 (Page 19) provides brief description of the different interventions
Yeung[28]	Brief details of studies interventions are provided in table 1 (pages 34-35). Mainly the interventions was the provision of treatment in a Haemophilia Treatment Centre (HTC).

Summary statements of the best evidence of effectiveness

Evidence suggests that integrated care may reduce the risk of hospitalisation by approximately 19% for people with chronic health problems[27].

Integrated care appears effective in reducing readmissions for patients with heart failure, with an absolute risk reduction of 8% for first and 19% for subsequent rehospitalisation[27].

Studies with shorter follow-up, from three to 12 months, in general appeared to show a greater impact of integrated care than studies with longer follow-up of 18 months or more[27].

Evidence for the effectiveness for people with haemophilia specifically is less conclusive[28].

Table 14. Reviews of Integrated care interventions

Review	Review type (search date) Number of studies Intervention type	Main aim Setting/population	MQ	MR	TR	WoE	Main Findings (Strength of evidence)
Stephenson[27]	Rapid review of reviews (2016) (13 systematic reviews) (integrated care in the community)	To summarise the best available evidence on the impact of integrated care for patients with chronic conditions on hospital and ED utilisation and investigate trends in outcomes over time. (Chronic illness)	3	2	1	2	A total of 13 systematic reviews were included. Overall, evidence suggests that integrated care may reduce the risk of hospitalisation, with reviews including patients with diverse chronic conditions showing a 19% reduction. Integrated care appears effective in reducing readmissions for patients with heart failure, with an absolute risk reduction of 8% for first and 19% for subsequent rehospitalisation. For patients with chronic obstructive pulmonary disease, integrated care was associated with reductions in length of stay ranging from 2.5 to 4 days. Studies with shorter follow-up, from three to 12 months, in general appeared to show a greater impact of integrated care than studies with longer follow-up of 18 months or more. (Unclear – most likely Low)
Yeung[28]	Systematic review – narrative (2015) (N= 27 none of which were RCTs) (Integrated care)	Assessed the effects of the integrated care model for persons with haemophilia (Haemophilia)	3	2	2	3	In comparison to other models of care, integrated care may reduce hospitalisations and emergency room visits (Low to very low)

Intervention - various types of intervention

Two reviews focused on various interventions (table 15). One review sought to assess the effectiveness of a range of interventions (preventive medicine, telemedicine) to reduce the use of unplanned health care by rural populations (Brainard[29]). The remaining review focused on the evidence for the effectiveness of non-disease specific pre-discharge, post-discharge, or bridging interventions designed to reduce hospitalisation (Hansen[30]).

Table 15. Overview of multiple types of Intervention components

Study	Overview of intervention components across studies included in the review
Brainard[29]	Intervention strategies were diverse, although similar elements were often in both the most and least successful interventions. Interventions were categorised as self-management and case management, specific conditions, telemedicine (including remote support by specialists of local health care professionals), acute presentations and other. Some studies fall into more than one of these categories. Table 1 (pages 148-149) provides brief description of each of the included studies' interventions. Twelve studies described programmes that taught patients how to better self-manage long-term illness. Six studies were concerned with optimal case management of and routine treatment for chronically ill ('high risk') individuals in the community. Thirteen studies described telemedicine interventions. Three studies implemented triage protocols to assess immediate medical needs (or lack thereof) from unplanned presentations, and patients were often referred to other providers. Two studies describe interventions that were not so much intended to reduce unscheduled care, but rather were concerned not to increase it.
Hansen[30]	Pre-discharge interventions included patient education, medication reconciliation, discharge planning, and scheduling of a follow-up appointment before discharge. Post-discharge interventions included follow-up telephone calls, patient-activated hotlines, timely communication with ambulatory providers, timely ambulatory provider follow-up, and post-discharge home visits. Bridging interventions included transition coaches, physician continuity across the inpatient and outpatient setting, and patient-centred discharge instruction.

The majority of studies had "bundles" of the above components (these are described in the paper). Inadequate description of individual studies' interventions precluded meta-analysis of effects. Many studies identified in the review were single-institution assessments of quality improvement activities rather than those with experimental designs. Several common interventions have not been studied outside of multicomponent "discharge bundles."

Summary statements of the best evidence of effectiveness

There was little high-quality research assessing interventions to reduce unplanned health care use by rural residents.

Weak evidence from eight studies[29] (one RCT and seven non-RCT design) showed statistically significant reductions in unplanned care use. Three of these articles were concerned with management of chronic illness (asthma, COPD and generic), three were telemedicine articles (respiratory failure, advice about burns treatment or suspected major trauma and reduction in suicide risk) and one described affordable price community health clinics that provided preventative care to an otherwise underserved population. The majority of the other 25 articles reported reductions in use of unplanned care which lacked statistical significance, which often was not tested for at all[29].

In the other review[30] in this section, no single intervention implemented alone was regularly associated with reduced risk for 30-day rehospitalisation.

Table 16. Reviews of various interventions

Review	**Review type (search date) Number of studies Intervention type**	**Main aim Setting/population**	**MQ**	**MR**	**TR**	**WoE**	**Main Findings (Strength of evidence)**
Brainhard[29]	Systematic review – narrative (2014) (n=33: 8 of which were RCTs) (Various e.g. preventive medicine; telemedicine)	To review the effectiveness of interventions to reduce the use of unplanned health care by rural populations. (Rural populations)	2	2	1	2	Eight of the 33 studies reported modest statistically significant reductions in unplanned emergency care use while two reported statistically significant increases in unplanned care. Reductions were associated with preventative medicine, telemedicine and targeting chronic illnesses. (Low to very low)
Hansen[30]	Systematic review – narrative (2011) (N=43 of which 7 were RCTs) (Various in 3 categories: pre-discharge; post-discharge; bridging)	To describe interventions evaluated in studies aimed at reducing rehospitalisation within 30 days of discharge (Various diagnostic groups - Mainly general medicine)	2	1	2	2	No single intervention implemented alone was regularly associated with reduced risk for 30-day rehospitalisation. (Low)

Summary and conclusions

Rapid review question 1.

What is the range and nature of interventions that have been tested or evaluated? What are the types of interventions? What are the components of the interventions? What is the intensity and duration of any intervention? Who delivers the intervention? Where is the intervention delivered? Are interventions hospital based, community based or both?

Where possible, details have been provided regarding the range and nature of the various types of interventions that have been tested. These were broadly categorised as: hospital/care at home (seven reviews); transitional care (six reviews); care co-ordination/care strategy (six reviews); telephone support (three reviews); advanced/action care plans (three reviews); integrated care (two reviews); and two reviews on various types of interventions. It should be noted however, that whilst these broad areas of intervention type exist, they can and do overlap both in practice and in the individual studies and reviews in this area. Across this large body of evidence, it is noted by many review authors that the reports of included primary studies often do not provide sufficient descriptive detail regarding the components of the intervention. Where possible, this rapid review has summarised the main components and has also provided signposting to more detailed reporting within each review.

Rapid review question 2.

Which populations have interventions been tested on? Which conditions or problems? Which age ranges?

It can be seen from the reporting of the studies further above that the vast majority of participants in included studies were adults who live with some form of chronic physical illness. The majority of reviews (n=15) included a focus on various long term/chronic illnesses. Five reviews focused on heart failure, five reviews on COPD, and one review each on: rural populations; frequent users of health services; haemodialysis; haemophilia.

Rapid review question 3.

What is the evidence for the effectiveness of any interventions that have been tested?

A total of 29 reviews were included in this review of reviews. Regarding the methodological quality of the reviews themselves: four were graded as inadequate; five as satisfactory; 15 as good; and five as excellent. Regarding the methodological relevance of the reviews: three were graded as inadequate; four as satisfactory; 13 as good; and nine as excellent; regarding the topic relevance of the reviews:

none was graded as inadequate; one as satisfactory; 21 as good; and seven as excellent. With regard to weight of evidence: five were graded as inadequate; six as satisfactory; 14 as good; and four as excellent

Evidence of effectiveness across this wide body of literature is generally assessed as being of low quality. Seventeen reviews were assessed as having very low to low grade of evidence, whilst 12 reviews were assessed has providing evidence graded as low to moderate or moderate.

Hospital in the home: There is low to moderate quality RCT based evidence from some methodologically well conducted systematic reviews that hospital at home/ home care may be effective for reducing unplanned hospital admissions in people with different chronic or long term conditions. Moderate quality evidence from a well-conducted systematic review which includes 12 RCTs indicates that patients receiving in-home care had an average of one less unplanned hospitalisation (mean difference [MD]: −1.03; 95% CI: −1.53 to −0.53) and an average of one less emergency department (ED) visit (MD: −1.32; 95% CI: −1.87 to −0.77)[2].

Discharge planning: Among reviews of mixed patient populations, there was consistent evidence that enhanced discharge planning and hospital-at-home interventions reduced readmissions[10]. There is moderate-strength evidence that structured and individually tailored discharge planning reduces readmissions within 90 days (relative risk [RR]: 0.82, 95% confidence interval [CI]: 0.73 to 0.92)[9] and hospital length of stay (20.91 days, 95% CI: 21.55 to 20.27)[8]. Among seven reviews in specific patient populations, transitional care interventions reduced readmission in patients with congestive heart failure and general medical populations[10].

Care coordination: Moderate evidence suggests that health education reduces all-cause readmission at three months. Home visit also reduces COPD-specific readmissions, but does not reduce all-cause readmissions. A review of studies on frequent users of health services, found (low to moderate evidence) that significantly fewer patients in the intervention group than in the control group were admitted to hospital (relative risk [RR] 0.81, 95% confidence interval [CI] 0.72–0.91). One review focused on heart failure provides low to very quality data indicating that hospital-initiated nurse co-ordinated care management compared with usual care reduces readmissions (rate ratio 0.74 (95% CI 0.60 to 0.92), p=0.008). Hospital readmissions, length of hospital stay, institutionalization, emergency department visits, and hospitals/primary care visits were all identified as health care utilisation outcomes of case management interventions and there is low quality evidence that these interventions reduced health care utilisation. However, results were mixed.

Telephone support: Evidence across three reviews is graded as low to very low. No definitive statement can be made about the effectiveness of telephone follow-up (TFU). The variability of evidence regarding TFU guidelines points to the need for further research with larger sample sizes and more rigorous methodologies. It should be noted though that telephone support is included as one of the components of many other types of “bundled” interventions.

Advanced care planning: The best evidence (although of low quality) suggests that advance care planning may reduce hospitalisation in heart failure patients. However, it is not clear to what degree. Evidence is limited or of very low quality regarding the effectiveness of care plans for patients with COPD, or for advanced care planning for people undergoing haemodialysis.

Integrated care: Evidence suggests that integrated care may reduce the risk of hospitalisation by approximately 19% for people with chronic health problems. Integrated care appears effective in reducing readmissions for patients with heart failure, with an absolute risk reduction of 8% for first and 19% for subsequent rehospitalisation. Studies with shorter follow-up, from three to 12 months, in general appeared to show a greater impact of integrated care than studies with longer follow-up of 18 months or more. Evidence for the effectiveness for people with haemophilia specifically is less conclusive.

Various interventions: In one review, there was little high-quality research assessing interventions to reduce unplanned health care use by rural residents. Weak evidence from eight studies (one RCT and seven non-RCT design) showed statistically significant reductions in unplanned care use. Three of these articles were concerned with management of chronic illness (asthma, COPD and generic), three were telemedicine articles (respiratory failure, advice about burns treatment or suspected major trauma and reduction in suicide risk) and one described affordable price community health clinics that provided preventative care to an otherwise underserved population. In a further review, focusing on pre/post-discharge and bridging interventions, no single intervention implemented alone was regularly associated with reduced risk for 30-day rehospitalisation.

Rapid review question 4.

What is the evidence for the cost of any interventions?

Cost was rarely reported in reviews and rarely considered in primary studies. Where costs were considered, (for example see box below) the information was either lacking or limited to one specific type of intervention or limited with regard to its relevance to a UK context. The example below is one of the few instances where cost evidence for a UK setting is actually provided.

Example of a consideration of cost within a review from Brainard[29]. It is a review of interventions delivered mainly to general medical patients at three times: pre-discharge; post-discharge; bridging.

One of the interventions the review focussed on was telemedicine. It was noted that in some studies the provision of such a service could result in cost savings from the reduction in need for transportation of patients to the hospital. The authors note the following:

"In most of the telemedicine applications, unplanned care was still sought and received, but the costs for providing care were believed to be lower than an alternative protocol of transport to, assessment at and treatment at a large hospital emergency department. Stated per patient estimated cost savings in preventing emergency transport or transfers were Canadian $300 (US $326 at August 2015 prices), Canadian $5350 (US $5425) and UK £929 (US$2210.19). These cost savings were calculated as the cost to transport plus cost to treat at emergency centre minus the cost to treat using telemedicine. Total savings in one multi-centre telemedicine project were calculated at Australian $320 118 (US$340 370), although not every centre in the project had net savings. In the context of the Canadian, UK and Australian health systems, these savings per patient or per project were considered by the study authors to be substantial and justified continued service provision. Net cost savings were claimed but not specified in two studies."

Rapid review question 5.

Of the available evidence, which is relevant to the Scottish context? Based on the available evidence, which are likely to be the best interventions to adopt in Scotland?

Evidence in this area was very limited. Relatively few studies included in the reviews were noted to be UK based and even fewer Scottish based. However, this was a rapid review and further time consuming but detailed scrutiny of the available evidence may discover some studies that do have direct relevance for the Scottish context. It is therefore the case that the reader of this report must make their own assumptions about whether or not any of the review findings do have relevance for the current and future design and delivery of interventions in the Scottish context.

Conclusions

This rapid review aimed to find and assess a wide range of reviews evaluating the effectiveness of interventions designed to reduce hospitalisations in community-dwelling adults with physical health problems. Although 29 reviews were identified (comprising at least 770 RCTs), few provided sufficiently robust and detailed evidence to recommend implementation of specific interventions. Fewer still were conducted in the context of the UK NHS, making it challenging to assess how easily these interventions could be replicated, or whether their implementation would deliver the same levels of success.

Whilst it is not possible from the review to be definitive in recommending specific interventions for NHS Scotland, there were five broad (although overlapping) types of interventions identified for which there was at least moderate evidence of effectiveness. A brief search identified that many of these types of interventions already exist in some form within NHSScotland.

For example, the **hospital in the home** model already exists in some areas. The Rapid Elderly Assessment Care Team (REACT) was established in 2013 to offer a 'hospital at home' service, whereby a multidisciplinary team offers rapid assessment within a homely setting. The initiative is part of a trial comparing typical hospital care with hospital at home.

Protocols, toolkits and guidance already exist within NHS Scotland for structured **discharge planning**, and for proactive, planned and **coordinated care** management. Similarly, the ihub provides an **Anticipatory Care Planning** toolkit, which provides guidance for health professionals, service users and their families. The guidance for health professionals suggests that:

> *"there is increasing evidence that appropriate access to community services and good anticipatory care, supported by the development of a Key Information Summary (KIS) that contains the right information, can reduce the risk of hospital admission by 30–50%."*[31]

An **integrated approach** to care is a key priority for Scotland and the management and delivery of health and social care services, which have previously been managed separately by the NHS and local authorities, have been brought together.

Clearly, NHSScotland is already developing and implementing initiatives which have shown to be successful. What is more difficult to identify, and which was out with the scope of this review, is the extent to which these interventions are routinely used, the components of the interventions as they have been applied and the extent to which they have been tailored to the context and to the individual. The context within which these interventions have been implemented previously in Scotland has, and continues to, change rapidly not least because of the integration agenda. In determining how best to reduce hospital readmissions it will be important to be cognisant of the context within which any intervention is introduced and the potential influence this will have on the implementation and outcomes. A robust, structured and systematic approach to describing what is implemented (the intervention) and how (the process) along with a comprehensive evaluation protocol will help to determine the effect of any intervention on the key performance indicators, such as readmission and length of stay, and person-centred outcomes.

Strengths and weaknesses of the rapid review

This was a rapid review with a search strategy limited to only seven research databases and to studies published since 1999. A more comprehensive search would doubtless find many more studies. The review is further limited because only relatively high-level details of findings were reported due to time and resource constraints. Individual studies do contain relevant and interesting data, however this could only have been reported in more detail had more time and resource been available to do so. However, the full papers of all included studies are also furnished with this report, and where required, the reader is guided to a particular page in a particular study for more detailed information (e.g. the reader may be referred to a particular table in the publication). Furthermore, because of the rapidity of the review, it was only possible to provide global estimates of the nature and quality of the available evidence. Such an approach to the assessment of methodological quality and weight of evidence, whilst a useful shorthand guide, is limited. Full assessment of aspects of methodological quality and risk of bias is required before statements can be made about the true nature of the evidence. Despite the limitations of the review, it has been possible to gather together a large body of highly relevant evidence in this area together in a very short space of time.

References

1. Caplan GA, Sulaiman NS, Mangin DA, Aimonino Ricauda N, Wilson AD, Barclay L. A meta-analysis of "hospital in the home". Med J Aust. 2012;197(9):512-9.

2. Health Quality Ontario. In-home care for optimizing chronic disease management in the community: an evidence-based analysis. Ont Health technol Assess Ser. 2013;13(5):1-65.

3. Shepperd S, Iliffe S, Doll HA, Clarke MJ, Kalra L, Wilson AD*, et al.* Admission avoidance hospital at home. Cochrane Database Syst Rev. 2016(9).

4. Totten AM, White-Chu EF, Wasson N, Morgan E, Kansagara D, Davis-O'Reilly C*, et al.* Home-based primary care interventions. Effective Health Care Program: Comparative Effectiveness Review. 2016(164).

5. Vandiver T, Anderson T, Boston B, Bowers C, Hall N. Community-Based Home Health Programs and Chronic Disease: Synthesis of the Literature. Prof Case Manag. 2018;23(1):25-31.

6. Jeppesen E, Brurberg KG, Vist GE, Wedzicha JA, Wright JJ, Greenstone M*, et al.* Hospital at home for acute exacerbations of chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2012(5).

7. Wong CX, Carson KV, Smith BJ. Home care by outreach nursing for chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2012(4).

8. Verhaegh KJ, MacNeil-Vroomen JL, Eslami S, Geerlings SE, de Rooij SE, Buurman BM. CHRONIC CARE. Transitional Care Interventions Prevent Hospital Readmissions For Adults With Chronic Illnesses. Health Aff. 2014;33(9):1531-9.

9. Leppin AL, Gionfriddo MR, Kessler M, Brito JP, Mair FS, Gallacher K*, et al.* Preventing 30-day hospital readmissions: a systematic review and meta-analysis of randomized trials. JAMA Intern Med. 2014;174(7):1095-107.

10. Kansagara D, Chiovaro JC, Kagen D, Jencks S, Rhyne K, O'Neil M*, et al.* So many options, where do we start? An overview of the care transitions literature. J Hosp Med. 2016;11(3):221-30.

11. Van Spall HGC, Rahman T, Mytton O, Ramasundarahettige C, Ibrahim Q, Kabali C*, et al.* Comparative effectiveness of transitional care services in patients discharged from the hospital with heart failure: a systematic review and network meta-analysis. Eur J Heart Fail. 2017;19(11):1427-43.

12. Kamermayer AK, Leasure AR, Anderson L. The Effectiveness of Transitions-of-Care Interventions in Reducing Hospital Readmissions and Mortality: A Systematic Review. Dimens Crit Care Nurs. 2017;36(6):311-6.

13. Naylor MD, Aiken LH, Kurtzman ET, Olds DM, Hirschman KB. The care span: The importance of transitional care in achieving health reform. Health Aff. 2011;30(4):746-54.

14. Huntley AL, Johnson R, King A, Morris RW, Purdy S. Does case management for patients with heart failure based in the community reduce unplanned hospital admissions? A systematic review and meta-analysis. BMJ Open. 2016;6(5):e010933.

15. Joo Jee Y, Huber DL. Case Management Effectiveness on Health Care Utilization Outcomes: A Systematic Review of Reviews. West J Nurs Res. 2019;41(1):111-33.

16. Prieto-Centurion V, Markos MA, Ramey NI, Gussin HA, Nyenhuis SM, Joo MJ*, et al.* Interventions to reduce rehospitalizations after chronic obstructive pulmonary disease exacerbations. A systematic review. Ann Am Thorac Soc. 2014;11(3):417-24.

17. Yang F, Xiong Z-F, Yang C, Li L, Qiao G, Wang Y*, et al.* Continuity of Care to Prevent Readmissions for Patients with Chronic Obstructive Pulmonary Disease: A Systematic Review and Meta-Analysis. COPD. 2017;14(2):251-61.

18. Tricco AC, Antony J, Ivers NM, Ashoor HM, Khan PA, Blondal E*, et al.* Effectiveness of quality improvement strategies for coordination of care to reduce use of health care services: A systematic review and meta-analysis. Can Med Assoc J. 2014;186(15):E568-E78.

19. Shah B. Effectiveness of Interprofessional Care Teams on Reducing Hospital Readmissions in Patients with Heart Failure: A Systematic Review. Medsurg Nurs. 2018;27(3):177-85.

20. Hobbs JK. CNE SERIES. Reducing Hospital Readmission Rates in Patients with Heart Failure. Medsurg Nurs. 2016;25(3):145-52.

21. Jayakody A, Bryant J, Carey M, Hobden B, Dodd N, Sanson-Fisher R. Effectiveness of interventions utilising telephone follow up in reducing hospital readmission within 30 days for individuals with chronic disease: a systematic review. BMC Health Serv Res. 2016;16:1-9.

22. Johnson MB, Laderman M, Coleman EA. Enhancing the Effectiveness of Follow-Up Phone Calls to Improve Transitions in Care: Three Decision Points. Jt Comm J Qual Patient Saf. 2013;39(5):221-7.

23. Rietjens JAC, Sudore RL, Connolly M, van Delden JJ, Drickamer MA, Droger M*, et al.* Definition and recommendations for advance care planning: an international consensus supported by the European Association for Palliative Care. Lancet Oncol. 2017;18(9):e543-e51.

24. Howcroft M, Walters EH, Wood-Baker R, Walters JAE. Action plans with brief patient education for exacerbations in chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2016(12).

25. Kernick LA, Hogg KJ, Millerick Y, Murtagh FEM, Djahit A, Johnson M. Does advance care planning in addition to usual care reduce hospitalisation for patients with advanced heart failure: A systematic review and narrative synthesis. Palliat Med. 2018;32(10):1539-51.

26. Lim CED, Ng RWC, Cheng NCL, Cigolini M, Kwok C, Brennan F. Advance care planning for haemodialysis patients. Cochrane Database Syst Rev. 2016(7).

27. Stephenson MD, Lisy K, Stern CJ, Feyer A-M, Fisher L, Aromataris EC. The impact of integrated care for people with chronic conditions on hospital and emergency department utilization: a rapid review. Int J Evid Based healthc. 2019;17(1):14-26.

28. Yeung CHT, Santesso N, Pai M, Kessler C, Key NS, Makris M*, et al.* Care models in the management of haemophilia: a systematic review. Haemophilia. 2016;22 Suppl 3:31-40.

29. Brainard JS, Ford JA, Steel N, Jones AP. A systematic review of health service interventions to reduce use of unplanned health care in rural areas. J Eval Clin Pract. 2016;22(2):145-55.

30. Hansen LO, Young RS, Hinami K, Leung A, Williams MV. Interventions to reduce 30-day rehospitalization: a systematic review. Ann Intern Med. 2011;155(8):520-8.

31. ihub. Anticipatory Care Planning: Guidance for Health and Social Care Professionals [online]. [cited 2019 Oct 07]; Available from: https://ihub.scot/project-toolkits/anticipatory-care-planning-toolkit/anticipatory-care-planning-toolkit/guidance-for-health-and-social-care-professionals/.

Appendix 1. Characteristics of included reviews

Study ID	Review type (search date) (number of studies) (intervention/s)	Main aim (setting/population)	MQ	MR	TR	WoE
Brainard[29]	Systematic review – narrative (2014) (n=33: 8 of which were RCTs) (Various e.g. preventive medicine; telemedicine)	To review the effectiveness of interventions to reduce the use of unplanned health care by rural populations. (Rural populations)	2	2	1	2
Caplan[1]	Systematic review with meta-analysis (2012) (n=61 RCTs) (Hospital in the home)	To assess the effect of "hospital in the home" (HITH) services that significantly substitute for in-hospital time on mortality, readmission rates, patient and carer satisfaction, and costs. (Various diagnostic groups – mainly stroke, COPD and elderly/frail elderly) Consider excluding	2	1	1	2
Hansen[30]	Systematic review – narrative (2011) (N=43 of which 7 were RCTs) (Various in 3 categories: pre-discharge; post-discharge; bridging)	To describe interventions evaluated in studies aimed at reducing rehospitalisation within 30 days of discharge. (Various diagnostic groups - Mainly general medicine)	2	1	2	2
Health Quality Ontario[2]	Systematic review with Meta-analysis (2012) (n=12 RCTs) (In-home care)	To compare the effectiveness of care delivered in the home (i.e., in-home care) with no home care or with usual care/care received outside of the home (e.g., health care setting). (Various diagnostic groups - Mainly cardiovascular)	1	1	2	1
Hobbs[20]	Systematic review – narrative (2013) (N=8 of which 5 were RCTs) (Telephone follow-up)	To evaluate if post-discharge telephone follow-up for adult with heart failure reduces hospital readmission rates. (Heart Failure)	3	2	2	3
Howcroft[24]	Cochrane Systematic review with meta-analysis (2015) (N=7 RCTs) (Action Plans)	To compare effects of an action plan for COPD exacerbations provided with a single short patient education component and without a comprehensive self-management programme versus usual care. (COPD)	1	1	2	2
Huntley[14]	Systematic review with Meta-analysis (2015) (N=22 of which 17 were RCTs)	To investigate the effectiveness and related costs of case management	1	1	2	1

	(Nurse coordinated multicomponent care)	(CM) for patients with heart failure (HF) predominantly based in the community in reducing unplanned readmissions and length of stay (LOS) (Heart Failure)				
Jayakody[21]	Systematic review – narrative (2015) (N=10 of which 1 was an RCT) (Telephone follow-up)	To investigate the effectiveness of telephone follow-up, either on its own or in combination with other intervention components. (Chronic Illness)	3	3	2	3
Jeppesen[6]	Cochrane Systematic review with Meta-analysis (2012) (N= 8 RCTs) (Hospital at home)	To evaluate the efficacy of hospital at home compared to hospital inpatient care in acute exacerbations of COPD (COPD)	1	1	1	1
Johnson[22]	Non-systematic review of the literature (2013) Selected studies (Telephone follow-up)	Examined peer reviewed articles examining telephone follow-up to improve post-discharge processes and reduce avoidable readmissions (Various)	4	4	2	4
Joo Jee[15]	Review of reviews (2017) (N= 7 reviews involving a total of 76 RCTs) Case management	Evaluated the effectiveness of case management interventions for improving health care utilisation outcomes for individuals with chronic illnesses (Chronic illness)	2	1	1	2
Kamermeyer[12]	Systematic review – narrative (2016) (N=13 of which some ?4 were RCTs) (Transfer of care)	Assessed the clinical effectiveness of Transfer of Care interventions to reduce 30-day readmission rates. (Various)	3	3	2	3
Kansagara[10]	Review of reviews (2017) (N= 10 reviews – 319 RCTs) (Transitional care)	Summarises the health and utilisation effects of transitional care interventions, and to identify common themes about intervention types, patient populations, or settings that modify these effects (Various)	2	2	1	2
Kernick[25]	Systematic review – narrative (2017) (N= 8 of which 3 were RCTs) (Advanced care planning)	Evaluates the literature regarding advance care planning in heart failure (Heart failure)	2	3	1	3
Leppin[9]	Systematic Review with Meta-analysis (2013) (N= 42 RCTs) (Transitional care)	Synthesised the evidence of the efficacy of interventions to reduce early hospital readmissions and identify intervention features, including their impact on treatment burden and on patients' capacity to enact post-discharge self-care that might explain their varying effects.	2	2	2	2

		(Various – majority of studies with elderly – consider excluding)				
Lim[26]	Systematic Review with Meta-analysis (2016) (N= 2 RCTs) Advanced care planning	To determine whether advance care planning in haemodialysis patients, compared with no or less structured forms of advance care planning, can result in fewer hospital admissions or less use of treatments (Haemodialysis patients)	2	2	2	4
Naylor[13]	Non-systematic review (Not stated – prior to 2011) (N= 21 RCTs) (transitional care)	To examine effective transitional care interventions within the context of health reform, focussing only on randomized clinical trials conducted in the United States (Chronic illness)	4	4	2	4
Prieto-Centurion[16]	Systematic review – narrative (N= 5 RCTs) (intervention bundles (i.e., multiple interventions implemented as part of a care strategy)	Review of randomized clinical trials evaluating interventions to reduce the rehospitalisations after COPD exacerbations. (COPD)	2	2	2	2
Shah[19]	Systematic review – narrative (N= 10 studies, 3 of which were RCTs) (Interprofessional care teams)	Examines the evidence for the effectiveness of interprofessional care teams to reduce readmissions in people with Heart failure. (Heart failure)	4	3	2	4
Shepperd[3]	Cochrane Systematic review with Meta-analysis (2016) (N= 16 RCTs) (Hospital at home)	To determine the effectiveness and cost of managing patients with admission avoidance hospital at home compared with inpatient hospital care (various – including COPD, Stroke)	1	1	2	1
Stephenson[27]	Rapid review of reviews (2016) (13 systematic reviews – not clear how many RCTs) (integrated care in the community)	To summarise the best available evidence on the impact of integrated care for patients with chronic conditions on hospital and ED utilisation and investigate trends in outcomes over time. (Chronic illness)	3	2	1	2
Totten[4]	Systematic review – narrative (2015) (N= 19 of which 2 were RCTs) (Home based primary care)	Assessed the available evidence about home-based primary care (HBPC) interventions for adults with serious or disabling chronic conditions. (Serious or disabling chronic conditions)	2	2	2	2
Tricco[18]	Systematic review with Meta-analysis (2014) (N=50 of which 36 were RCTs) (Care co-ordination)	Evaluated the effectiveness of interventions to improve the coordination of care to reduce health care utilisation in frequent users if health services. (Frequent users of health services)	2	2	3	3

Van Spall[11]	Systematic review with Network Meta-analysis (2015) (N= 53 RCTs) (Transitional care services)	Compared the effectiveness of transitional care services in decreasing all-cause death and all-cause readmissions following hospitalization for heart failure. (Heart failure)	2	1	2	2
Vandiver[5]	Systematic review – narrative (N= 11 of which 2 were RCTs) (Community-based home health programmes)	Reviewed and evaluated literature on the various community-based home health programs and their effectiveness at preventing hospital admissions in adults. (Chronic illness)	4	4	2	4
Verhaegh[8]	Systematic review with Meta-analysis (2013) (N= 26 RCTs) (Transitional care)	Examined if transitional care interventions were associated with a reduction of readmission rates in the short (30 days or less), intermediate (31–180 days), and long term (181–365 days) (Chronic illness)	2	2	2	2
Wong[7]	Cochrane Systematic review with Meta-analysis (2011) (N= 9 RCTs) (Home care by outreach nurses)	Evaluated the effectiveness of outreach respiratory health care worker programmes for COPD patients in terms of improving lung function, exercise tolerance and health related quality of life (HRQL) of patient and carer, and reducing mortality and medical service utilisation. (COPD)	2	2	2	2
Yang[17]	Systematic review with Meta-analysis (2015) (N= 31 RCTs) (Continuity of care)	Assessed the efficacy of continuity of care as interventions, which reduced readmission and mortality. (COPD)	2	2	2	2
Yeung[28]	Systematic review – narrative (2015) (N= 27 none of which were RCTs) (Integrated care)	Assessed the effects of the integrated care model for persons with haemophilia (Haemophilia)	3	2	2	3

Appendix 2. Description of intervention components for some of the excluded reviews

Study	Population studied	Intervention type	Intervention components
Aronow, 2018	Chronic Congestive Heart Failure	Non-invasive communication technology	No details described. Broad interventions types included: interactive voice interviews; personal digital assistants; telemonitoring and telephone support. A sub-group of studies also examined transitional care.
Blakemore, 2015	Asthma	Complex interventions	Complex interventions were defined as involving one or more of the following components: 1. General education: basic provision of information, commonly using didactic techniques 2. General discussion: discussion within a group facilitated by professionals or lay leaders 3. Skills training: teaching of practical skills e.g. blood sugar results, meal planning 4. Exercise: specific exercise sessions as part of intervention 5. Behavior therapy: use of behavioral techniques, such as goal setting, reinforcement, modeling 6. Relapse prevention: discussion of how to maintain behavior to minimize risk factors in the future and prevent relapses 7. Problem solving: identification of problems or barriers to behavior and strategies to overcome them 8. CBT: teaching or use of behavioral or cognitive techniques to influence mental health 9. Social support: teaching techniques to specifically help participants improve social support 10. Relaxation: actual practice of relaxation may include imagery or distraction techniques 11. Biofeedback: use of biological feedback to assist relaxation 12. Miscellaneous: complex intervention (or component thereof) that cannot be placed in the above categories or which are not described in sufficient detail. Thirty-three studies were included. The mean number of treatment components included within each intervention was 3.2 (range 1-9). The average number of treatment sessions (stated in 28 studies) was 4.4 (range 1-24); in five studies the exact number of additional health practitioner contacts associated with the interventions were unclear, most frequently because the number of contacts was flexible. Treatment was delivered in hospital or doctor's clinic in 12 studies, at home or in the community in 10, and in a combination of these in eight. Treatment was delivered through face-to-face contact in 20 studies, telephone in five and a combination in eight. The intervention was delivered by a non-mental health practitioner in 27 studies, was non-practitioner delivered in one and unclear in five. None was delivered by a mental health practitioner. Treatment was delivered by a multidisciplinary team in 10 studies and a unidisciplinary team in 18. Twenty-five of the studies used a structured management plan, 28

Study	Population studied	Intervention type	Intervention components
			included scheduled follow-up, eight included enhanced interprofessional communications, and in 6 this constituted collaborative care.
Bourbeau, 2015	Chronic Obstructive Pulmonary Disease	Self-management	Does not describe interventions from studies.
Cabilan, 2015	Adult surgical patients	Prehabilitation	This review should be excluded since it does not focus on community-dwelling adults.
Ditewig, 2010	Chronic Heart Failure	Self-Management	In all studies, the main component of self-management interventions consisted of education. Patients were particularly educated about early recognition of signs and symptoms due to HF, the importance of pharmacological treatment adherence, daily weighing and changing lifestyle. In 16 studies, patients were specifically emphasised to self-monitor their physical condition, supported by education, self-monitoring programmes, patient diary cards or devices. In seven studies, patients were also given the opportunity to self-adjust diuretics when weight increased.
Du Toit, 2019	Rural and remote Emergency departments	Telehealth	This review should be excluded since it does not focus on community-dwelling adults.
Gibson, 2002	Asthma	Education	Asthma education may take many forms. At its simplest level, education is limited to the transfer of information about asthma, its causes and its treatment. 12 RCTs of limited asthma education (information only)
Gorthi, 2014	Heart Failure	Disease management programmes	Included home care, outpatient clinic interventions, structured telephone support, and non-invasive and invasive telemonitoring.
Goyal, 2016	Heart Failure	Exercise programmes	Only one study was included. The intervention included a 12-week exercise programme individualised according to a baseline physical assessment. Each exercise session comprised a warm-up phase, a 30-minute exercise phase including both aerobic and resistance training, and a cool-down phase. Sessions were designed to occur at home, as well as once per week at a gymnasium with other enrollees. Subjects in the intervention group were also evaluated weekly by a clinical nurse consultant who could initiate treatment and/or refer patients to a medical practitioner for signs of decompensated HF.
Kash, 2017	Wide variety of health problems	Health Information Exchange	Health Information Exchange is defined as the transfer of electronic health information – laboratory test results, medication lists, and other clinical information – among organisations and providers.
Kotb, 2015	Heart Failure	Telemedicine	Telephone support, telemonitoring, video monitoring or electrocardiographic monitoring for HF patients. Thirty eligible randomised control trials were included. In most, a single telemedicine intervention was compared with usual care. In 27 of 30 trials, participants were followed for six or more months and in 25 trials the intervention was delivered for six or more months. However, the frequency of delivering the intervention did vary considerably. In most trials, the health professional that typically delivered the intervention was a nurse.
Kruse, 2017	Chronic Heart Disease	Telemedicine	No details provided
Long, 2017	Heart Failure	Telemonitoring	Limited information

Study	Population studied	Intervention type	Intervention components
Long, 2019	COPD	Health Coaching	Interventions were delivered by a range of health care professionals: nurse (n = 5), pharmacist (n= 1), and health coach (n = 1). Three studies used the Self-Management Programme of Activity, Coping and Education (SPACE) COPD manual. Participants were introduced to the manual by a physiotherapist (n = 2) or a member of the intervention team (n = 1) and instructed to work through it independently. The average number of health coaching sessions was 7 (range = 3–16), but in two studies, the number of sessions varied between participants. In addition to health coaching, one study incorporated an inpatient pulmonary rehabilitation (PR) component with an exercise programme, which means it is difficult to say with confidence that any positive effects of this intervention are due to health coaching alone.
Mares, 2013	Coronary artery bypass graft surgery	Nurse-led cardiac rehabilitation programs	In two trials the interventions were home-based and in one trial the intervention was hospital-based. The length of the interventions ranged from four weeks to 12 weeks. The interventions comprised intensive exercise programs, psychoeducation, life style management, telephone support and home visits. One trial included only patients who had partners.
McBain, 2015	Three chronic conditions, heart failure, hypertension and chronic obstructive pulmonary disease.	Self-monitoring	Self-monitoring was defined as the patient undertaking one or more of the following activities (i) Awareness: Self-measurement of vital signs, symptoms, behaviour or psychological well-being, (ii) Interpretation: Self- interpretation of vital signs, symptoms, behaviour or psychological well-being; or (iii) Response: Self-adjustment of medication, treatment, lifestyle or help-seeking behaviour as a result of self-awareness and/or self-interpretation. Delivered by any method. (Electronic Additional file 5 is a table with detailed information about the characteristics of the interventions).
Mekonnen, 2016	High risk patients (e.g. elderly, multiple medications)	Pharmacist-led medication reconciliation programmes	Some studies compared comprehensive medication reconciliation programmes, for example, multifaceted interventions including telephone follow-up and/or home visit, and patient counselling, or both telephone/home visit and patient counselling. After medication reconciliation, a few studies additionally included a formal medication review.
Moore, 2016	COPD	Pulmonary Rehabilitation	Pulmonary rehabilitation is defined as “a comprehensive intervention based on a thorough patient assessment followed by patient-tailored therapies, which include, but are not limited to, exercise training, education, and behaviour change. The intention of pulmonary rehabilitation is to improve the physical and psychological condition of people and to promote long-term adherence of health-enhancing behaviours.” It is a key component of the multidisciplinary management of COPD and can improve exercise capacity, dyspnoea, activities of daily living, muscle strength, and self-efficacy.
Peytremann, 2015	Asthma	Chronic disease management	Chronic Disease Management (CDM) is centred on patients’ needs, fosters the co-ordination and integration of health services provided by various professionals who should work together (multidisciplinary care), and emphasises patients’ self-management as well as education and empowerment. CDM consists of a group of coherent interventions designed to prevent or manage one or more chronic conditions using a systematic multidisciplinary approach potentially employing multiple treatment modalities. The goal of chronic disease management is to identify persons at risk for one or more chronic conditions, to promote self-

Study	Population studied	Intervention type	Intervention components
			management by patients and to address the illness or conditions with maximum clinical outcome, effectiveness and efficiency regardless of treatment setting(s) or typical reimbursement patterns". Because CDM programmes are adapted to the regional healthcare, social, and political contexts, they vary in terms of treatment modalities, frequency, intensity, and duration.
Rodriques, 2017	Hospitalised patients being discharged	Pharmacy-Supported Transfer Of Care	Pharmacy-Supported Transfer Of Care (TOC) intervention characteristics varied. The most common interventions were patient counselling (n = 48, 86%), medication reconciliation (n = 45, 80%), and patient-centred follow-up (n = 45, 80%). Timing of interventions varied throughout the TOC continuum (i.e., at admission, during hospitalisation, at discharge, and/or post discharge), with the most common timing of interventions being at post discharge (n = 45, 80%) followed by at discharge (n = 32, 57%). Patient-centred follow-up was reported as a telephone call in 21 studies; a combination of either telephone, home, and/or clinic visit in 12 studies; a clinic visit in eight studies; or a home visit in four studies. The majority of interventions were conducted with pharmacy personnel as the sole intervener (n = 37, 66%), whereas the remaining studies utilised pharmacy personnel as part of the TOC team.
Rosano, 2013	Primary care patients with ACSCs including chronic diseases, such as diabetes and asthma, and acute diseases, such as pneumonia and appendicitis with complications.	Accessibility of primary care services	Examined the relationship between physician supply and rates of avoidable hospitalisation.
Rotter, 2012	Multiple conditions.	Clinical pathways	Hospitalised patients only (not community-dwelling), so should be excluded.
Rotter, 2010	Same as above	Same as above	Same as above.
Royal, 2006	Primary care patients	Interventions in primary care aimed at reducing medication related adverse events	Of 38 included studies, they were categorised as: 17 pharmacist-led interventions (of which 15 reported hospital admissions as an outcome); eight interventions led by other primary healthcare professionals that reported preventable drug related morbidity as an outcome; and 13 complex interventions that included a component of medication review aimed at reducing falls in the elderly (the outcome being falls).
Rushton, 2017	Patients having undergone coronary artery bypass graft surgery	Individualised education	Eight studies with different interventions: 1) State Action on Avoidable Rehospitalisations; 2) Planned discharge teaching and counselling by the research nurse beginning from hospitalisation; 3) Individualised education intervention telephone 1-1 patient nurse interaction. Patient identified the topics. Then the nurse

Study	Population studied	Intervention type	Intervention components
			used the educational material in post discharge intervention information; 4) Individualised assessment tool used to determine education needed plus videos and written material; 5) Pre-admission video, patient centred info at admission and discharge 'v' standard care -nurses trained to deliver; 6) Discharge training and counselling assessed preoperatively and at 2nd and 10th day post-discharge days & end of ninth week; 7) Patient targeted education, IE using learning needs scale to assess; 8) Information moderation behavioural model using a range of teaching to small groups ?not individualised.
Self, 2014	COPD	Action plans and oral corticosteroid therapy	Only 5 trials were included: 1) self-care management included education with 1hr teachings for 8 wks followed by weekly phone f/u for 8 wks then monthly phone f/u for remainder of the study of 1 year. Action plan was customized for each patient for the management of infective symptoms (defined as at least two of the following: dyspnoea, sputum, or sputum purulence). Patients were instructed to initiate antibiotics and an OCS for 10–14 days; 2) Pulmonary rehabilitation and self-management education, provision of a written, personalised COPD action plan, monthly telephone calls and three-monthly home visits by a specialist nurse for a period of 2 year; 3) Both groups received four 2-hour COPD patient education sessions regarding overall self-management Intervention group received training on self-treatment of exacerbations (when to start a course of OCS and/or a course of antibiotics). A respiratory nurse followed up via tele-phone at four, 12, and 26 weeks after intervention; 4) Intervention group received individual education sessions (1–1.5 hours), an action plan for self-management of exacerbations, and monthly follow-up calls from a case manager. The individualized written action plan consisted of refillable prescriptions for OCS and an oral antimicrobial agent, a case manager's contact information, and the telephone number of a 24-hour helpline; 5) Intervention group consisted of four individual COPD education sessions (1.5 hours each) and one group session, an action plan for exacerbations, and scheduled telephone calls from a case manager. The written, individualised action plan for home management of exacerbations included prescriptions for OCSs and an antibiotic. Patients were taught to initiate the action plan within 48 hours of the onset of exacerbation symptoms.
Shi, 2018	Chronic kidney disease	Multidisciplinary care models	DC was defined as "the staff of the MDC group comprised at least nephrologists and nurses and that or the operation model of the MDC, patients with CKD were managed and educated with medical management and lifestyle modifications according to the different stages of CKD. Professionals in MDC across the studies included: nephrologist; nurses; dietitian; pharmacists; social workers.
Spinewine, 2013	Patients being discharged from hospital	Medication management	Exclude as not community-dwelling.
Taylor, 2018	Heart failure	Exercise-based cardiac rehabilitation	Different types of exercise training for at least 3 weeks. All trials evaluated an aerobic exercise intervention; six also included resistance training. Exercise training was most commonly delivered in either an exclusively centre-based setting or a centre-based setting in combination with some home exercise sessions. Three trials were

Study	Population studied	Intervention type	Intervention components
			conducted in an exclusively home-based setting. The dose of exercise training ranged widely across trials. ExCR was delivered over a period of 12 to 90 weeks, with between 2 and 7 sessions per week; median session duration was between 15 and 120 min (including warm-up and cool-down). The intensity of exercise ranged between 50% to 85% peak VO2.
Van Galen, 2017	Medical patients	Acute medical units	Studies acute medical units in hospitals so review should be excluded.
Wan, 2017	Heart failure	8 principles of choice, rest, environment, activity, trust, interpersonal relationships, outlook, and nutrition.	A range of interventions incorporating some or more of the 8 guiding principles.

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